ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

MARCH 1956

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FOUNDED 1866

How To Protect Domestic Mining

Here's a practical policy that benefits consumers and producers alike. p 75

The Metal Price Mirage

Try a yardstick that shows what's really happening to metal prices. p 80

Faster Prospecting

How the airborne geophysical laboratory tells you more, faster. p 84

Cutting Mining Costs

Jumbo-carloading unit continues to startle the industry. p 92

Mining Practice Survey

Six pages full of production ideas used in mining today. p 96

Western Miners Get Together

What went on at the Colorado Mining Association Meeting in Denver. p 102

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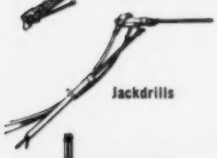
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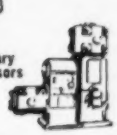
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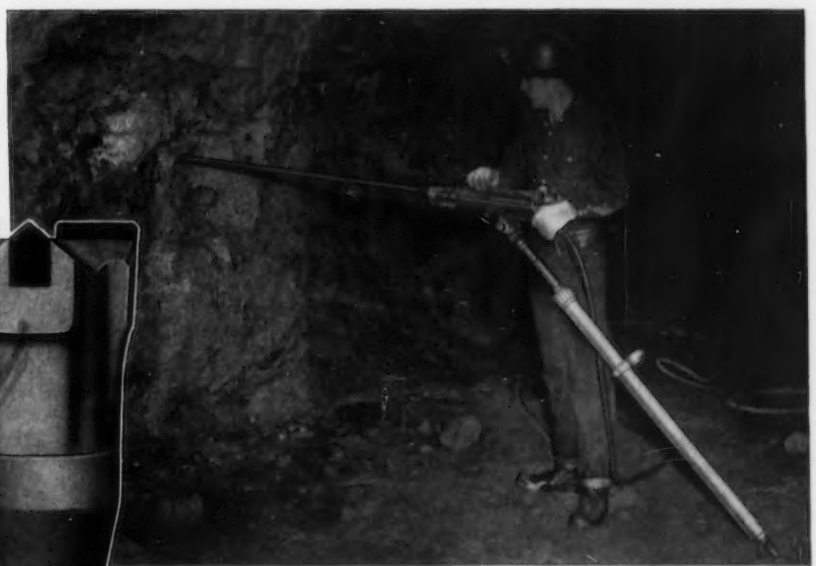

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90th YEAR OF PUBLICATION

VOL. 157 NO. 3

MARCH 1956

FEATURE ARTICLES

Benefits of a Healthy Domestic Mining Industry ..... Andrew Fletcher 75

How to Insure a Better Future ..... Frank G. Breyer 80

Airborne Geophysics 84

New Gismo-Carloading Combine Speeds Development and Tunnel Work 92

Mining Review, Part II ..... Lloyd E. Antonides 96

Colorado Mining Association Meeting 102

REGULAR DEPARTMENTS

New Products Digest . 35

Editorial 67

E&MJ Outlook 68

Markets 69

This Month in Mining 72

Behind the By-Lines . 74

Washington Impact . 106

Operating Ideas 110

New Books 114

Personals 116

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LETTERS

How Does Management Feel?

It seems obvious from the letters in the January issue of *E&MJ* which comment on your article "Engineering in the Outfield" that at least the lower ranks in the mining industry are not impressed with the factual evidence for the existence of an adequately satisfactory future in their chosen technical field. This observation is further fortified by the comments one hears at many of the frequent technical gatherings held around the country; a dissatisfied attitude is prevalent.

I have personally noted a marked reluctance of graduates in mining and geology, whom I consider men of promising ability, to continue in the field for which they have prepared. This is a problem for very serious consideration since it is presumed that replacements for the present leaders in the mining industry should come from this large segment of our ranks.

One of the most often and strongly expressed criticisms of the mining industry is directed toward the way it handles its personnel problems. These are pointed most specifically toward management. The opinions of the dissatisfied are most often expressed and best known in all probability. How about learning something about the other side of the question? How does management feel about the criticisms directed against it? If present policies contribute to the unrest in the lower ranks and possibly to the shortage of technical manpower, why are not such policies reviewed and changed?

Raymond F. Robinson
Tucson, Arizona

Early Expedition

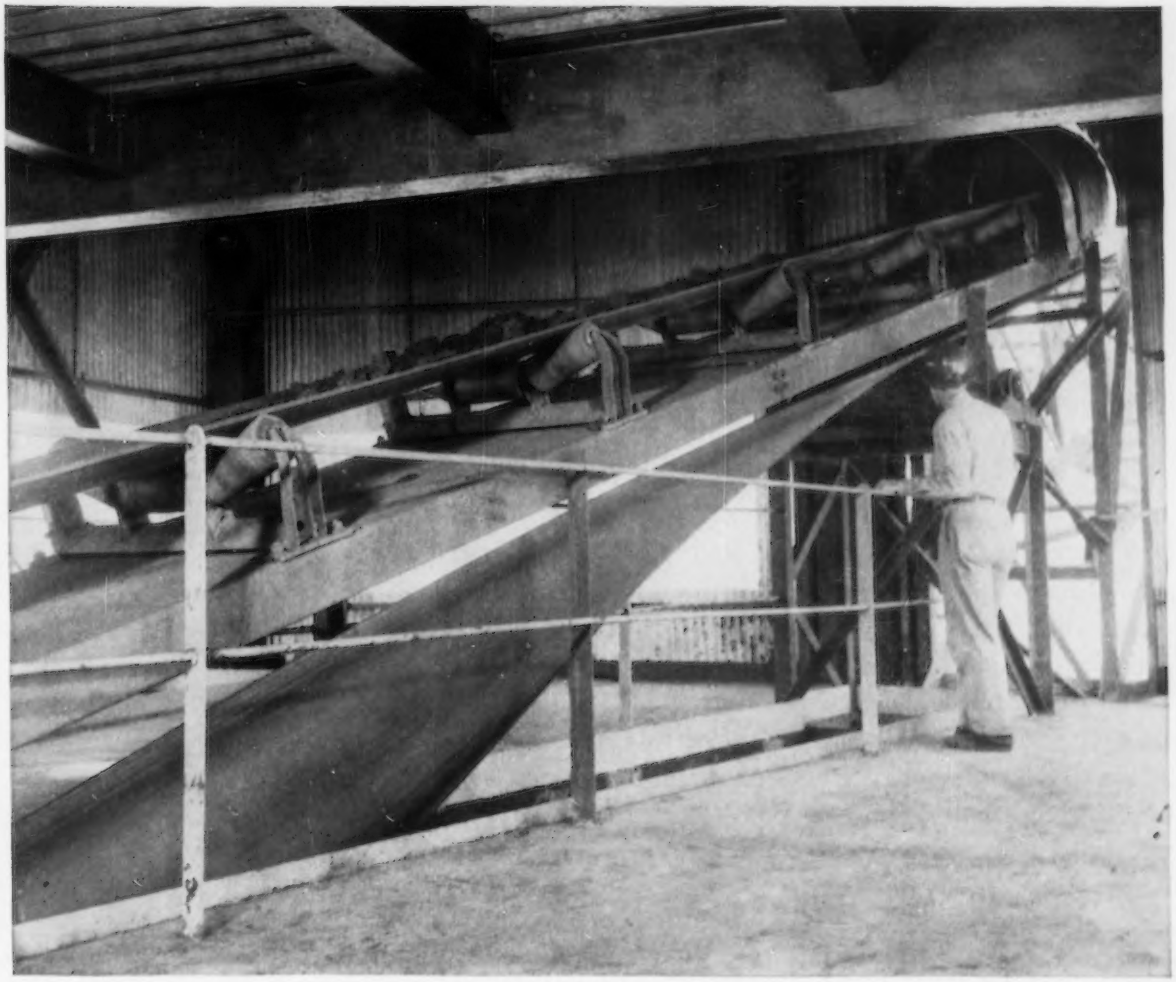
Would you have in any back numbers of *E&MJ* an account of the first discovery of minerals on the east coast of Labrador? The one I have in mind would be located about 200 miles down north from the Noravian Missionary station at Nain. About 1903 or '04, I was on a little chartered steamer that took a party of geologists from Nova Scotia and left them there to investigate. I've always wondered if that was the beginning of later developments.

It seems that a sailing vessel had stopped for ballast at a little inlet and the captain noticed that it was the heaviest rock he ever had lifted. It was found to contain iron pyrites and the above expedition was the result.

Caroline Lockhart
Cody, Wyoming

• A check of our back issues produced nothing on this particular incident. Perhaps some of our readers have information about this expedition that would be of interest to Miss Lockhart, as well as ourselves.—Ed.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



How conveyors stay clean even when load is sticky

THAT stuff riding the conveyor belt is refuse from a coal washing plant on its way to a dumping point—550 feet uphill. When plans were drawn up, engineers said the usual conveyor system wouldn't be the answer here. They knew the wet clay and sticky sand would cling to the belt, build up into gummy layers, clog the return idlers and pulleys, and damage the belt cover.

To avoid this trouble, they installed something quite different in conveyors —the B. F. Goodrich "Turnover" belt system. Here's how it works. As the material is dumped off the end of the moving belt, the belt makes a 180° turn, runs empty along the return idlers, then makes another one-half turn (as shown above) before receiving the next load.

Only the clean side of the belt touches the idlers, so there's no chance for sticky materials to build up on them. Even wet materials can be handled in cold weather without danger of the belt freezing to the rotating metal parts.

With the "Turnover" belt, expensive decking can be eliminated. Clean up of spillage is no problem because any material that falls on the lower run of the belt is carried to the end and dumped off when the belt makes its turn. Damage to belt body is reduced because lumps of materials cannot be trapped between the belt and pulleys.

If you have an operation where sticky, freezing or corrosive materials must be moved from place to place, the B. F. Goodrich "Turnover" conveyor system can save you trouble and money. Your B. F. Goodrich distributor can give you full details and show you how easy it is to convert any conventional system into the turnover type. *The B. F. Goodrich Company, Dept. M-586, Akron 18, Ohio.*

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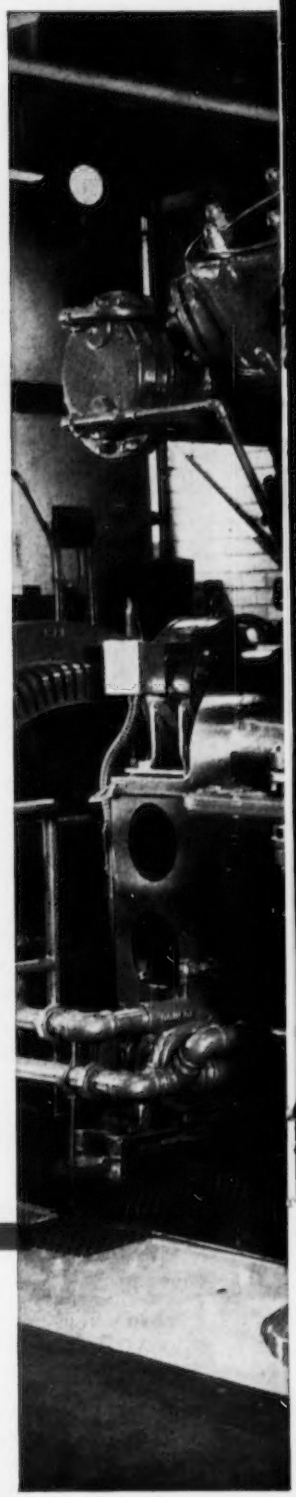

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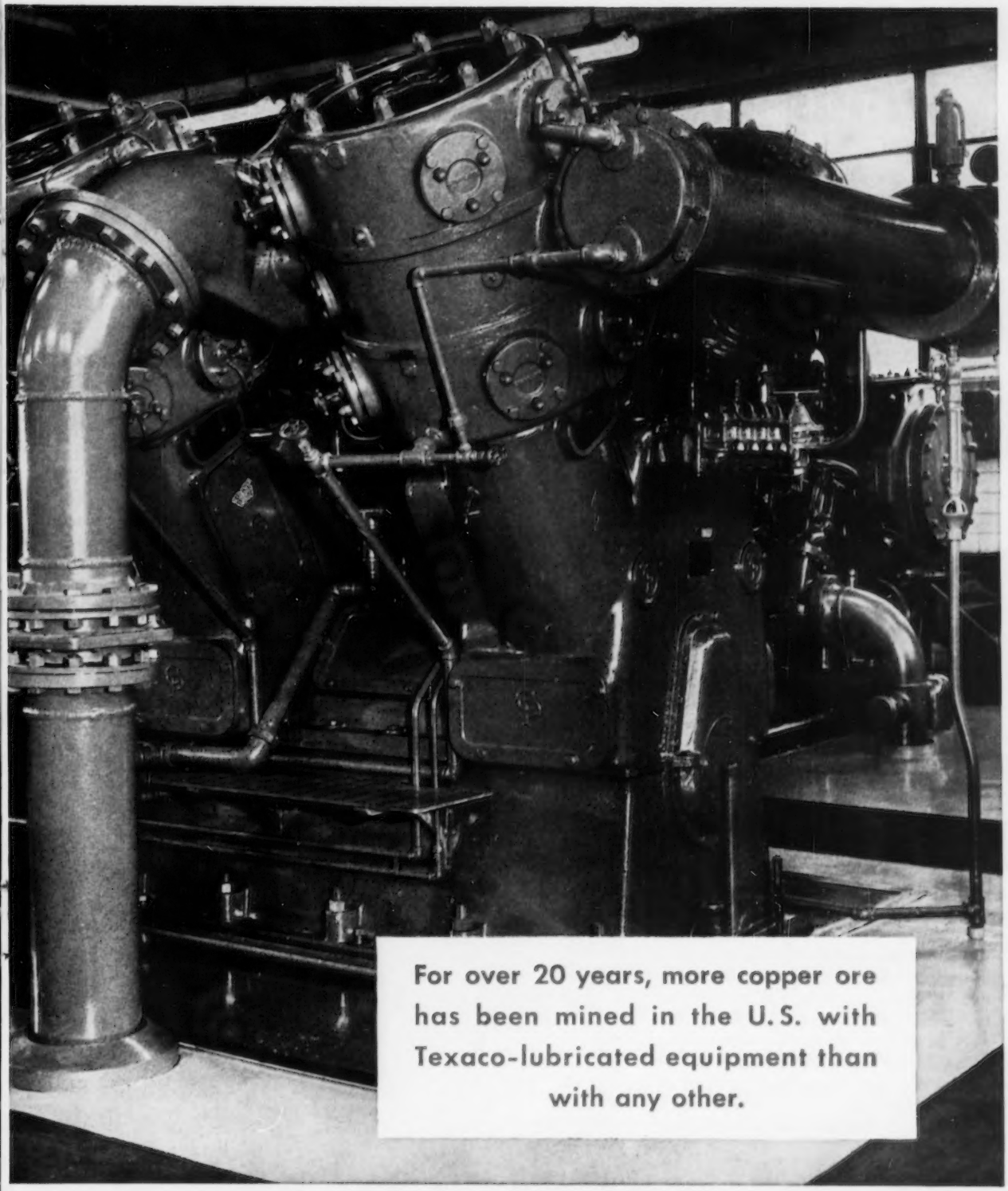

Lubricants and Fuels

FOR THE MINING INDUSTRY

Allis-Chalmers Crawler Tractors at work around World's Largest Copper Mine...

On the Haul Road to settling basin dike, this HD-21 levels fill. Here, torque converter matches tractor speed and push to load and terrain conditions . . . puts maximum power to work at all times moving big loads. Husky Allis-Chalmers diesel engine with follow-through combustion provides more power at most effective crankshaft angle . . . burns fuel completely . . . eliminates combustion knocks.

On the Dike this HD-21 dozes sandy fill. Truck wheels, idlers and support rollers require lubrication only at thousand-hour intervals. With Positive Seals that keep grease in, dust out, the HD-21 works efficiently in gritty materials.

Utah Construction Co.'s three HD-21's help build an addition to the settling basin dike for large western open pit copper mine

Where the jobs are the toughest, you will find Allis-Chalmers big HD-21 torque converter drive crawlers. That's why Utah Construction Co., owner of a fleet of HD-21's, put three of them to work on this mining job—raising the dike around the immense settling basin near the copper mills of a large open pit copper mining company. These advanced design crawlers are delivering big work output, steady operating dependability with low maintenance costs . . . handling clean-up around a shovel in the borrow pit, building haul roads, leveling fill on the dike. Read some of the reasons why.

On the Dike, an HD-21 levels fill. Narrow cowl and tapered hood give operator top visibility . . . big foam-rubber seat, convenient controls and finger-tip hydraulic steering make his job easier . . . reduce undue fatigue.

In Borrow Pit another HD-21 handles cleanup work to speed loading of hauling units by the shovel. Tru-Dimension machined and heat-treated track provides maximum toughness and wearability . . . gives longer track life in abrasive materials.

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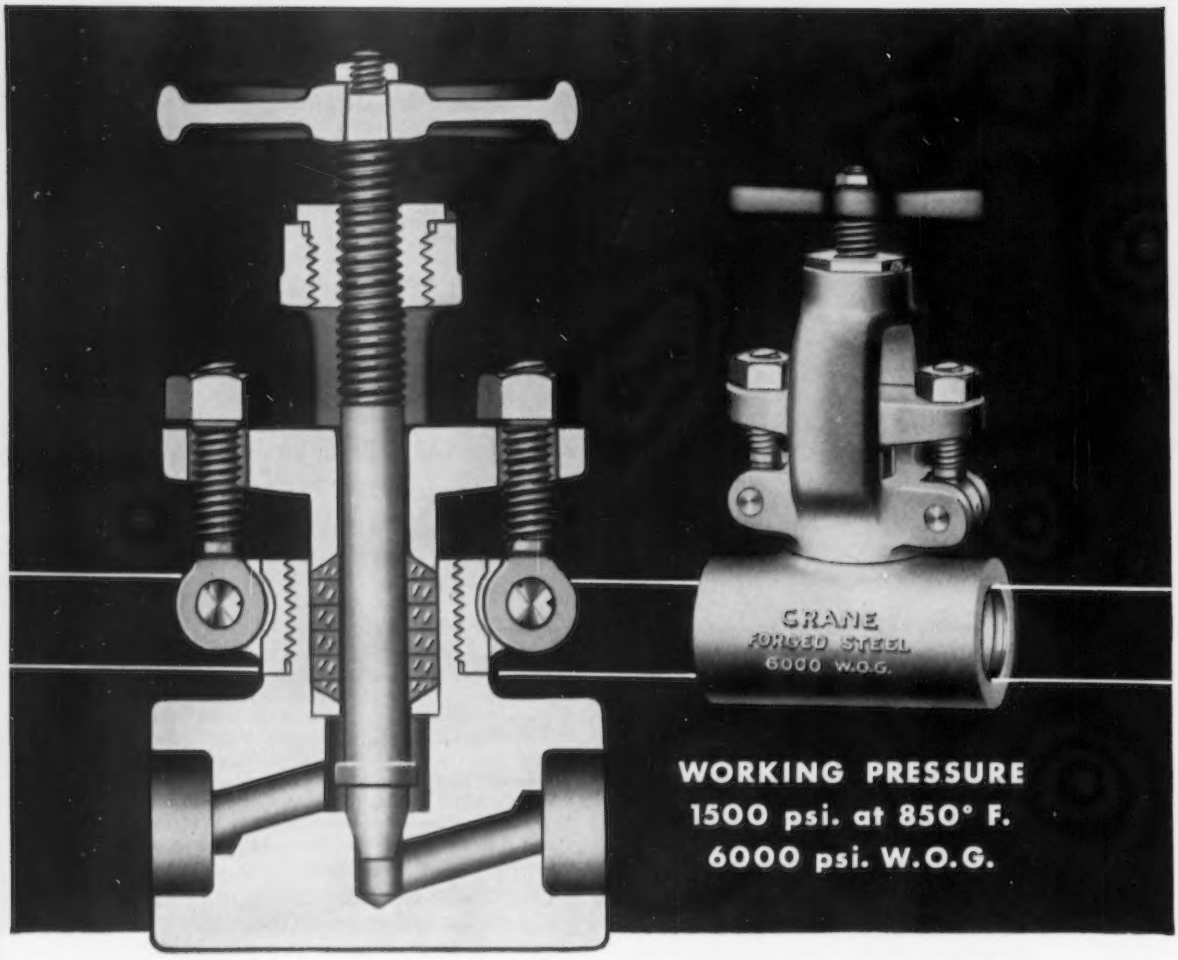

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Been looking for an exceptionally rugged, compact, and low-priced stop valve for your small hydraulic or high-pressure, high-temperature instrument lines?

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Literature on Request

These rugged, low-cost stop valves are built for 1500 psi. at 850° and 6000 psi. W.O.G. Construction and materials are job-engineered by Crane experts—backed by a century of quality manufacturing, matchless experience. You'll want complete information on the all-new Crane Forged Steel Instrument Valves.

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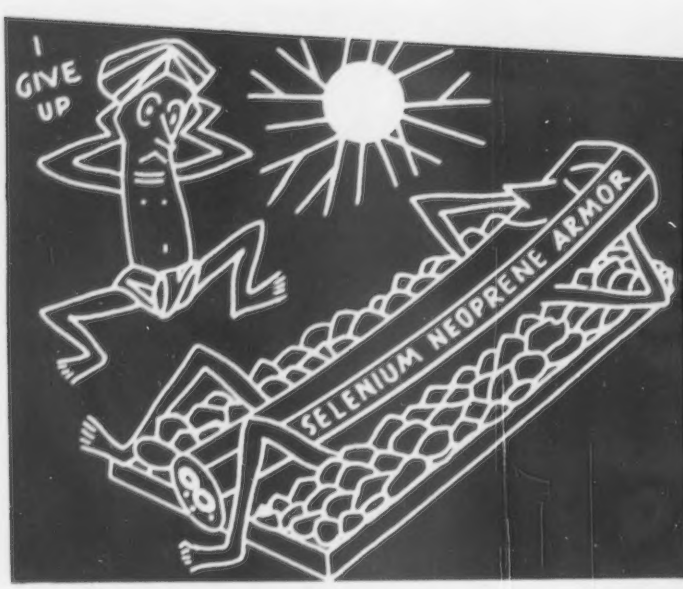

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because it's SELENIUM NEOPRENE

The drawing above, amusing though it may be, is an accurate rendition of one of the problems that faces a cable attached to a drill. Strong sunlight tends to harden some cable jackets and make them brittle. Ultraviolet rays found in the sunlight help to cause cracks by forming ozone. These cracks are the point of entrance for moisture, dirt, water, and more sunlight. Eventually the cable breaks down from these causes.

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We can't tell you about all its advantages here, but look over the leading features—then ask for the full story.

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- **The Northwest Dual Independent Crowd utilitizes force most independent crowd shovels waste. It handles harder rock and makes greater output possible.**
- **The "Feather-Touch" Clutch Control uses the power of the engine to throw heavy drum clutches giving ease of operation without the complications of compressor, pumps or other delicate mechanisms.**
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GISMO METHOD SETS NEW

New Production Records and Drastic Cuts in Man-hour Costs Foreseen!

COULD THIS BE THE BEGINNING of the "Gismo Age" in rock mining? One mine operator has said: "The Gismo is going to revolutionize rock excavation methods in much the same manner that large tractor drawn earth moving scrapers have revolutionized the earth moving procedure."

One new mine now being mechanized by the Gismo Method contemplates a production of 2,000 tons per day at an overall cost of about $1.00 per ton. Production is forecasted to be approximately 50 tons per man when operated on a 2,000 ton per day basis and 57 tons per man on a 4,000 ton basis. The deviser includes all men to be employed for production, surface and underground, including all supervisors. The above projection is based on results obtained over a three year period by this system in a similar mine.

An older mine, changing over to the Gismo Method, has increased tonnage per man-shift almost 10 times in the stoping operations. Compared to the conventional method used in 1950, the Gismo Method has halved both development and labor costs.

What is this equipment? It is a general purpose utility self-loading transport that is simple, versatile and built to take the punishment of rock excavation. No special development facilities or conditions are usually required. It operates in sloping ore bodies with irregular outlines, as well as large or relatively small openings. It loads in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills, moves boulder rocks . . . makes its own roadways and cleans up completely. It can load and transport up to 100 tons per hour with a 300 ft. haul.

It's an extremely simple piece of equipment requiring little maintenance. The Gismo's initial cost can be reasonably compared with one year's maintenance cost alone of much of the conventional equipment in present use.

It makes possible a mining method requiring few machines, few men, less planning and integration. It permits total mechanization of your mine—the solution to high man-hour and materials cost.

We urge you to compare the Gismo Method with other methods—from initial investment to overall effect on your operation's efficiency. Call, wire or write us today! *Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee.*

Sanford-Day IRON WORKS

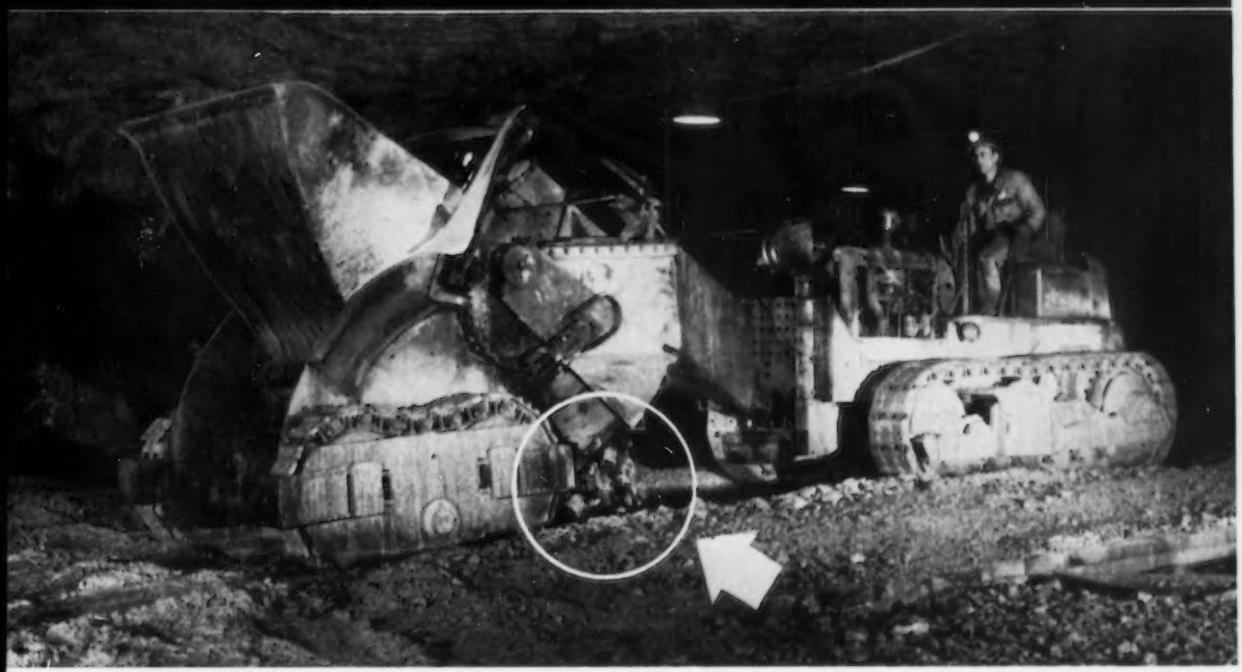
KNOXVILLE • TENNESSEE

AND BROWN-FAYRO DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
PUMPS - OIL SPRAY SYSTEMS

LOADING (MUCKING)— a one-man operation! The speed of the GISMO Self-Loading Transport can be fully appreciated and understood only when seen in actual operation. With sufficient ore and ample surge capacity, one GISMO as a self-loading transport and one GISMO equipped as a stope drilling jumbo will excavate out of a hard rock face over 400 tons in a six hour working time shift. The GISMO handles boulders . . . sets them aside for secondary blasting . . . and does not require a bulldozer, road grader or any other accessory device. The operator has complete control of his shoveling grade—can always look directly at the dipper edge. The shoveling action is gentle. Carrying capacity of the GISMO shown working above is 6 tons. Other capacities are available.

GOALS FOR ROCK MINING!



DUMPING: direct into surge pocket . . . skip pocket . . . conveyor for truck loading . . . or mine cars with ramps (for development work). GISMO above is dumping load into surge pocket. Both when mucking (loading material into body of GISMO) and when dumping the load, the dipper or shovel head is in position shown above. The surge pocket disconnects from a time cycle standpoint the next operation, transportation—permitting GISMO and the transportation system to operate independently of each other for maximum efficiency and production.

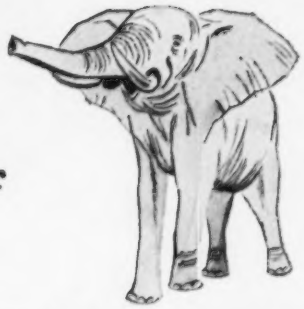
TRAMMING: fast and highly maneuverable! GISMO shown above is transporting load to a surge pocket. When emptied, GISMO will return to reload with dipper in position shown. As you can guess, the GISMO is a very simple machine functionally and mechanically. Compared to any other loading or mucking device (none of which are transports), the GISMO has a very large capacity.

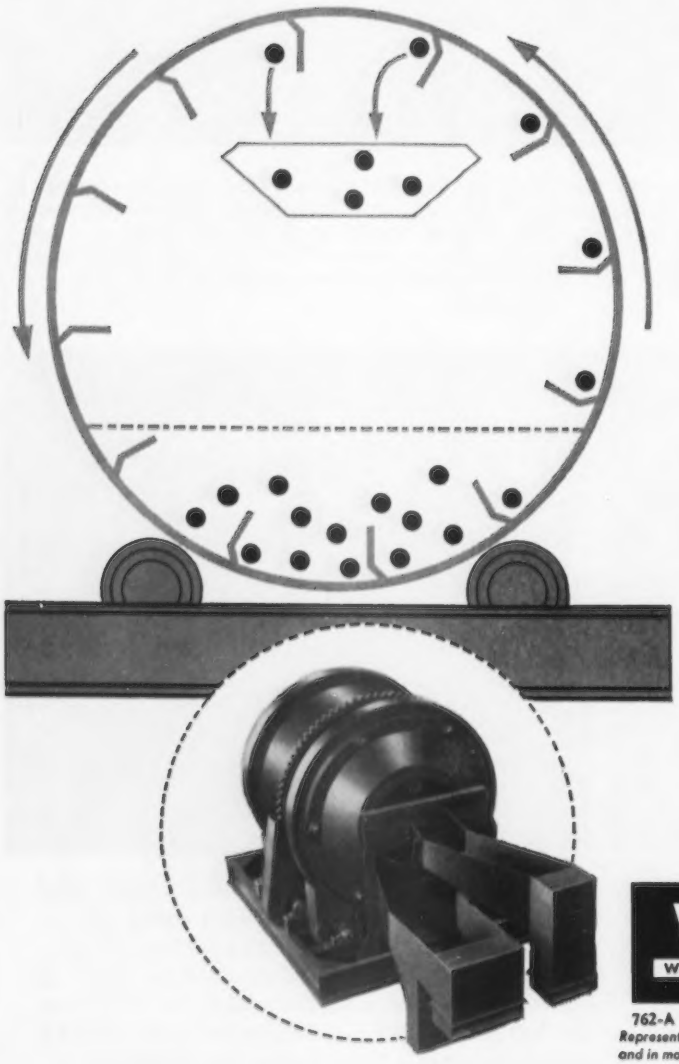
DRILLING: The GISMO will mount 2, 3, 4 or 5 drills at ideal locations for the efficient drilling of small or large headings, benches, rib-slabbing or back-slabbing. The GISMO Stope Drilling Jumbo mounting four drills and operated by two men often averages by the month over 400 feet per man shift. The Gismo Drill Jumbo can be easily converted to a Gismo Self-Loading Transport.

see for yourself

WHY THE WEMCO HMS DRUM DOESN'T WEAR OUT

Operators have observed that a Wemco HMS Drum Separator has a long long life.





The difference between this separator and others (that wear in a hurry) is that the entire Wemco Drum rotates as a unit. There are no moving parts inside — no chains, sprockets, screens, scrapers or sweeps to wear due to the extremely abrasive action of rock and medium. The lifters are a built-in part. In them the sink material stays in place until it drops out at top center. And even if the drum is shut-down fully loaded, there are no jamming or abrasion problems on start-up.

The common sense in this drum design is another example of Wemco's sound solution to mining industry problems. This Drum has become the most widely used of all HMS separatory vessels. It has helped, too, to make Wemco's HMS Mobil-Mill the world's most popular Heavy Media plant. Over 50% of all HMS plants use Wemco equipment. Write today and let us send you all the facts.

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WESTERN MACHINERY COMPANY

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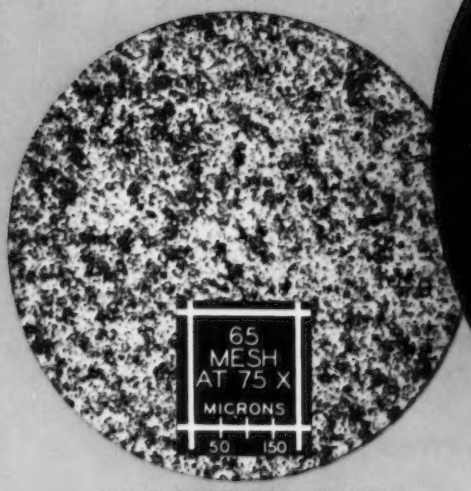
Representatives in principal cities of the United States and Canada and in major countries throughout the world.

Now - a choice of

3 AEROFLOC Reagents

to Improve Filtration and Settling by Powerful Flocculation at any pH



UNFLOCCULATED SLIMES

AFTER ADDING AEROFLOC REAGENTS

Study the photomicrographs above. Note how the addition of only 0.01 to 0.1 lb. per ton (0.1 to 5 ppm in dilute suspensions) of AEROFLOC Reagent flocculated the finely divided solids. Visualize how such powerful flocculation can improve filtration and settling at your mill.

In settling operations AEROFLOC Reagents speed up and effect more complete settling of both valuable concentrates and plant tailings or leach residues, thereby conserving values previously lost to thickener overflow or reducing solids content of plant effluents.

As a filter aid in operating plants, AEROFLOC Reagents increase filtration rates, make filter cakes firmer and more porous, help prevent blinding of filter cloth and increase washing ease and efficiency. In new and existing plants AEROFLOC Reagents can reduce capital expenditure by increasing the capacity of existing thickening and filtration installations or reducing size of new units required.

Three AEROFLOC Reagents are available—#548, #552 and #3000. The latter is especially recommended for acid pulps, but is also very effective in alkaline systems. But we suggest that you test all three because it is not possible to predict accurately which will perform best in any given application.

AMERICAN CYANAMID COMPANY

MINERAL DRESSING DEPARTMENT

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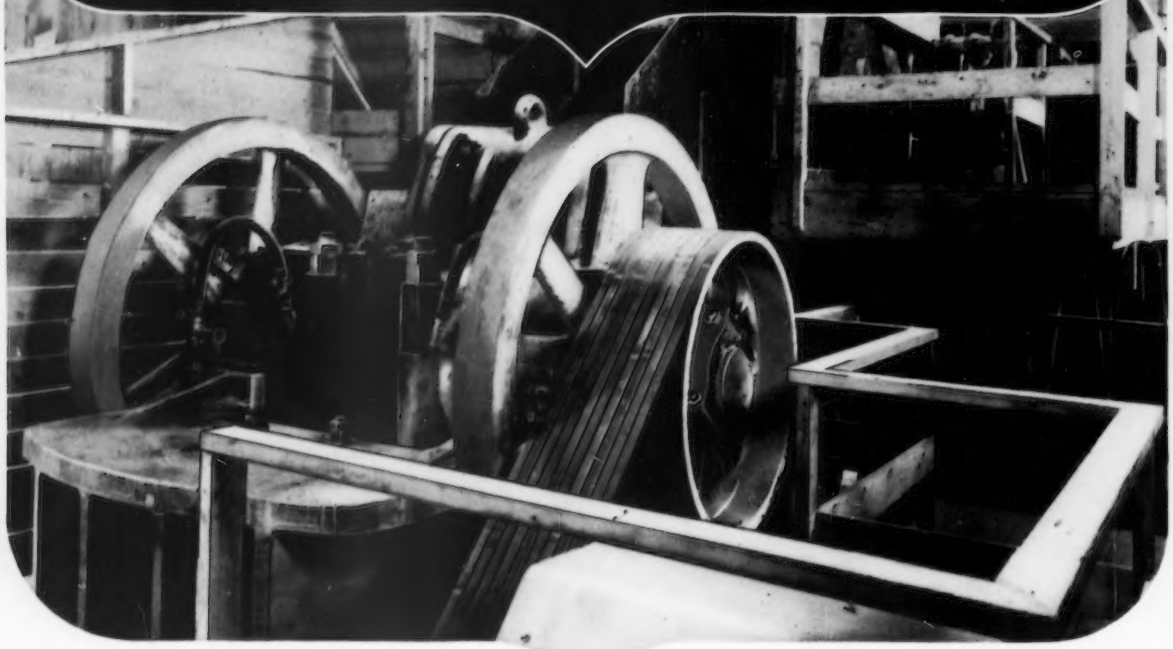
CYANAMID

Traylor ALL STEEL JAW CRUSHERS



CHOICE OF LEADERS IN THE MINING FIELD FOR HEAVY DUTY PRIMARY CRUSHING SERVICE

For over a half-century, leaders in the mining industry have relied on Traylor Jaw Crushers for profitable primary ore reduction. Traylor Jaw Crushers have earned this universal acceptance by their proven ability to increase production while lowering production costs. Their Traylor designed, non-chokable, curved jaw plates are of manganese steel . . . engineered to provide increased capacity in each succeeding feeding zone in the crushing chamber, thus eliminating packing and choking. Gradual wear is evenly distributed over the entire face of Traylor curved jaw plates. That's why Traylor curved jaw plates often outlast conventional plates by as much as 3 to 1. And . . . because the curved plates apply power as a direct crushing force . . . owners of Traylor Jaw Crushers realize greater production from greatly reduced horsepower requirements. Send for Traylor booklet on Jaw Crushers which fully describes all the features that make Traylor Jaw Crushers the choice of leaders in the mining industry.

There's a Traylor Jaw Crusher for every mining need. Traylor builds four different types. Each is built in a wide range of sizes. Feed openings range from 8″ x 12″ to 60″ x 84″; capacities from 4 to 1000 tons per hour.

A Traylor leads to greater profits

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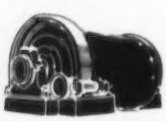
802 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfr: Canadian Vickers, Ltd., Montreal, P.Q.

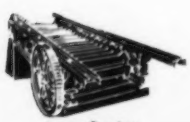
Primary Gyratory Crushers

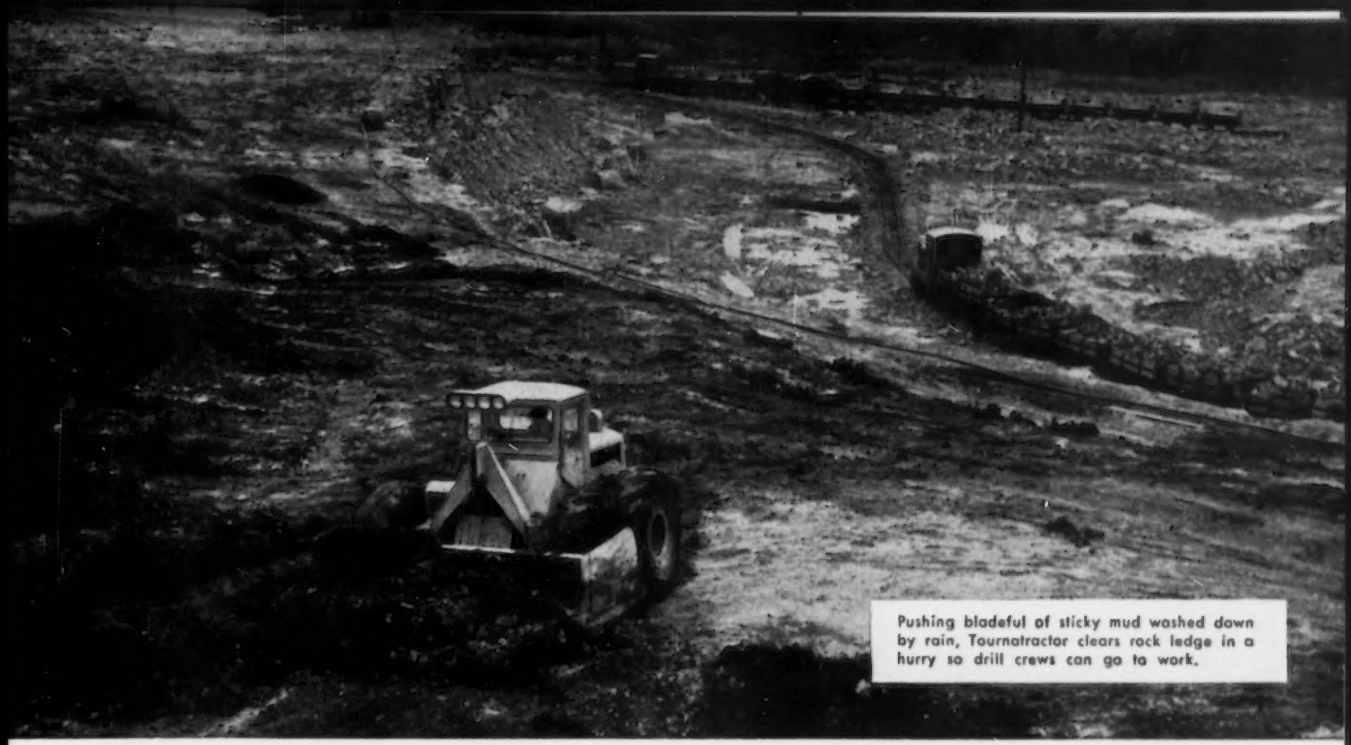
Rotary Kilns

Secondary Gyratory Crushers


Ball Mills

Jaw Crushers


Apron Feeders



Pushing bladeful of sticky mud washed down by rain, Tournatractor clears rock ledge in a hurry so drill crews can go to work.

1 machine handles all tractor work at 277-acre quarry & plant

To handle all the tractor jobs scattered around their 277-acre quarry and plant site in northern Illinois, a large cement company uses only 1 machine — a 186 hp Tournatractor.

In an average 8-hour day, this rubber-tired rig covers 20 to 25 miles in job-to-job travel. With a crawler-tractor, this would mean nearly half a shift would be spent lumbering along at top speeds of 5 to 7 mph just to get from one job to the next. With 19 mph Tournatractor, travel time to cover all the regular and emergency assignments around the 277 acres takes only an hour to hour-and-a-half . . . all the rest of the shift is productive work time. Tournatractor always takes shortest route between assignments . . . goes over haul roads, pavement, or cross country . . . drives over tracks without planking.

Completes 2-day track-move in 2 hours

Principal job for Tournatractor is cleaning up around stripping shovel.

In spare time, the tractor also:

1. Cleans up overburden unloaded by company's 3 side-dump trucks
2. Stockpiles coal
3. Maintains trash pile
4. Handles emergency switching of railroad cars used primarily to transport the 1,500,000 barrels of cement produced here annually.
5. Builds new roads
6. Maintains existing roads
7. Prepares drill sites by cleaning dirt from rock ledges
8. Relocates track for rock trains in quarry (does in 2 hours what by hand labor used to take 2 days)
9. Handles emergency dozing around pit and plant

"Does everything but sweep out the office"

"We like the Tournatractor," says the pit foreman, "because of its work speed and because of its speed in getting from job-to-job." Adds the operator, "With Tournatractor, you can get around and do a lot of different jobs fast! It does everything around here but sweep out the office."

Get all the facts

Before you buy another set of tracks, it will pay you, too, to investigate the high speeds, lower maintenance, and greater mobility Tournatractor can give. We will be glad to arrange a demonstration on your job so you can check these advantages first-hand.

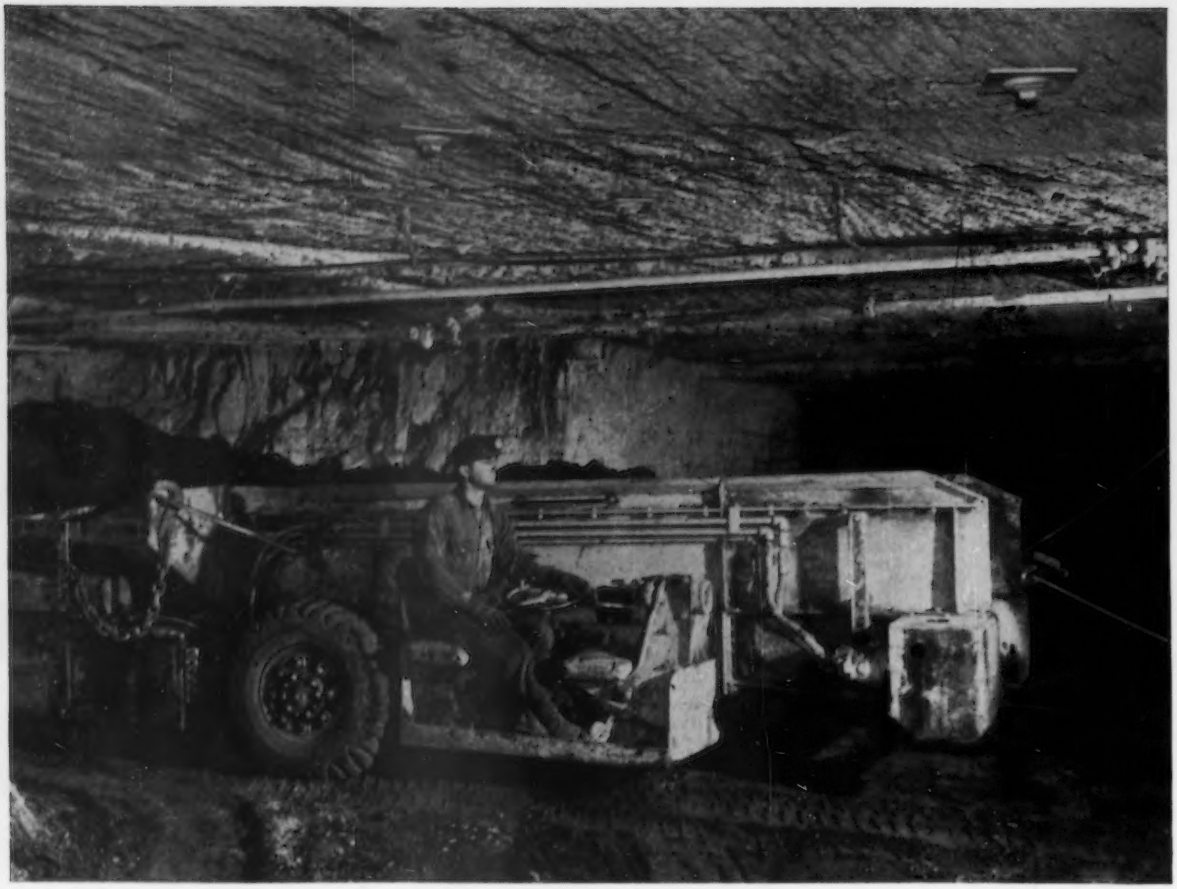
Finishing clean-up around rock shovel, Tournatractor "runs" on big rubber tires to next assignment. Its mobility, and the speed with which it completes each job, are major reasons why Tournatractor does a volume of work that otherwise takes 2 or 3 crawlers to handle.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-669-Q-bw

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



Here's the Way to Obtain a Sound Mine Roof

An ideal way to obtain sound roof in the mine is to anchor overlying layers of rock by means of the Bethlehem square-head roof bolt. This method of roof control promotes safety, and makes possible increased production through greater maneuverability of mechanized equipment. Ventilation improves, because there are no bulky supports. Less storage space is required.

The Bethlehem square-head roof bolt comes in ¾-in.-diam carbon-steel and ⅝-in.-diam high-strength types, both of which have a typical breaking load of 24,000 lb. It is also made in a ⅞-in.-diam high-strength type, having a typical breaking load of 45,000 lb.

All three bolts are used in conjunction with expansion shells, which provide positive locking action against the sides of the hole when the bolt is tightened. A hardened washer reduces friction between the bolt head and the roof plate, which is caused by high tension in the bolt producing excessive bearing pressure. The washer also permits free use of impact wrenches, without galling or tearing of metal.

If you would like to look into the advantages of a roof-bolting program in your mine, drop a line to the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Only the new B Tournapull

will give you thrills like this!

Drive the big boy . . .

Accurately rated capacity by SAE standards of 18 cu. yds., struck, or 25 cu. yds., heaped, makes the "B" an outstanding machine for the big yardage jobs.

Smooth . . . with 10 speeds

Ten speeds, plus clutch brake for fast shifting, means you can haul at higher speeds, complete more haul cycles per hour. Double-clutching and gear clash are eliminated. Low-gear speeds aid in loading, and make it easier to climb grades.

Load faster, easier

Welded box-beams and channel construction increase bowl strength to withstand stresses of fast loading. New push-block provides direct-line thrust to cutting edge. New scraper hoist-control gives fast pumping action in loose materials. New deflector plate piles heaping loads. Blade angle, improved weight distribution speed loading.

Dig those 7′ tires

"B's" 27.00 x 33, 30-ply tires provide ample safety margins. Rated to carry more than capacity loads, they don't overheat, don't wear as do overloaded tires on most self-propelled scrapers of this size.

Push-button action

Tournapull's electrical system puts the power right where it's needed with minimum friction loss. Dependable motors, never affected by weather, are operated by dashboard push-buttons. Action is instantaneous. Maintenance is simple.

Sure can cut those corners

"B" maneuvers in closer quarters than any other big self-propelled scraper, turns around non-stop in a space only 35′ wide. With "feather-touch" power-steer, operator controls this rig with no effort . . . maneuvers easily, safely, at high speed.

Longer season, less days off

Because of "B's" high tractive ability, you start work earlier . . . stop less often due to bad weather . . . add more productive time at end of season. Big, low-pressure tires give good traction in soft going. Differential automatically transfers power to match traction, minimizes wheel slippage. Electric system works accurately and dependably in heat or cold, rain or snow.

Safe and easy, she's a daisy

Operator rides comfortably on soft, foam-rubber cushioned seat. Pneumatic tires relieve stress and strain on man and machine. Fingertip electric controls work fast, sure, give less end-of-shift fatigue. Good visibility, low center of gravity, big disc-type brakes make Tournapull exceptionally safe to operate.

More uses, steadier work

Same B Tournapull prime-mover powers an interchangeable 35-ton rear-dump hauler. This means steadier work for you because your boss can keep this 2-wheel tractor working either with shovel rock or scraper dirt. Changeover, using same wheels, brakes, and electric controls, takes only a few hours.

Prototypes of the "B" were put through rugged tests on our new proving grounds. They were then tested on the job by leading contractors, under rugged field conditions. The result is a fully-proved machine. The new LeTourneau-Westinghouse Company backs the new "B" and every component in it.

Tournapull—Trademark Reg. U.S. Pat. Off. BP-883-G-b-w

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

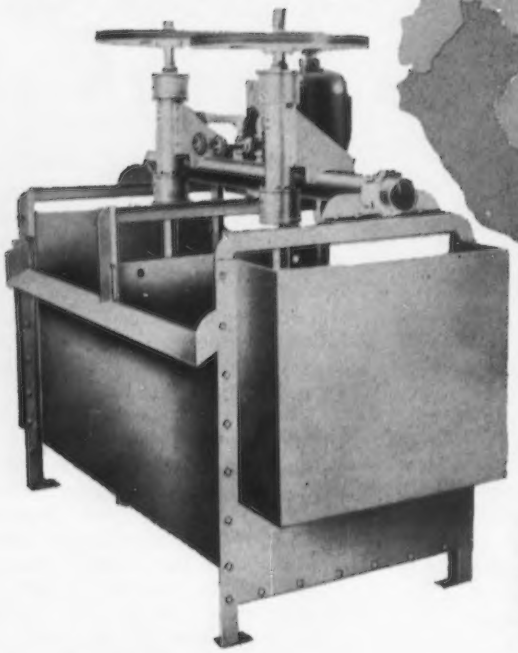
AGITAIR® *is there!*

successfully processing

LEAD, ZINC, COPPER

in Latin America

MEXICO, GUATEMALA, PERU AND CHILI



Latin America is one more section of the world where AGITAIR® FLOTATION MACHINES are playing an essential role in the production of important metals. In Mexico and Guatemala, AGITAIR® is extensively used in the processing of lead and zinc ores; in Peru, lead, zinc and copper ores; in Chili, for the beneficiation of copper ores at one of the world's largest copper mines.

AGITAIR's® world-wide acceptance is based on such factors as low cost of operation and maintenance; low power consumption; flexibility and ease of control; and AGITAIR's® rugged ability to stand the strain of continuous service year after year.

Write for full details on AGITAIR® and Galigher Ore Testing Service.

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Above Rear-Dump handles 53% of limestone haul for Allegheny Mineral Corp.

These LeTourneau-Westinghouse machines — a 186 hp Tournatractor (now 208 hp) and an 18-ton Rear-Dump—have been used by Allegheny Mineral Corporation, Cowansville, Pennsylvania, since the summer of 1953 both for stripping and for hauling shot limestone. Units work alternately at Allegheny's pits in Parker's Landing and Kittanning. They make trips between the two places under their own power. The Rear-Dump drives the 35 miles through traffic in about an hour; Tournatractor makes the trip in about two hours. Fingertip electric power steer and 4-wheel air brakes (more braking surface on 1 wheel than most units have on all 4) make for safe high-speed travel.

Above Rear-Dump is being loaded by a 1½-yd. shovel. Loads in the shot limestone usually weigh out at around 19 tons each. Note simplicity of the Rear-Dump body design. Unit has no frame, no sub-frame, no springs or spring hangers, no front steering wheels, no hydraulics . . . hence seldom needs repairs.

Low entry from rear, plus big 9½' x 12' target, speed loading . . . reduce spillage. Triple-layered all-steel body absorbs shocks of heavy, sharply-fragmented rock. High all-steel front guard protects driver, controls. Capacity of this Rear-Dump, without sideboards, is 44 tons. Other models carry 9, 35, and 50 tons.

Hauling shot limestone 4/10 mile from pit to crusher, Rear-Dump reaches 15 mph speeds, despite narrow roads, short sections of 10 to 15% grades and several sharp curves. Tires give adequate traction even on snow and ice. Material being hauled will be crushed into agricultural limestone and road-surfacing.

Waste material is dumped about half a mile from the shovel. Company records show Rear-Dump averages 34 loads per 8-hour shift — as much as the shovel can load. Note how body swings below and behind rear wheels. This keeps material from piling under unit, also allows safe dump over steep banks.

Spoil dumped by the LeTourneau-Westinghouse Rear-Dump and another hauler is leveled by Tournatractor. Other duties for this 19 mph tractor include leveling and maintaining limestone aggregate stockpiles, pulling a 15-yd. scraper to self-load and strip dirt and rock, and pulling a ripper to loosen rocky material.

Tournatractor blade carries 2½ cu. yds. per push. Electric-control down-pressure provides smooth cut. Tires roll without damage over abrasive footing which badly damages crawler tracks. Says Co-Owner C. H. Snyder, "LeTourneau-Westinghouse units just fit our layout. Their maintenance is low and production high."

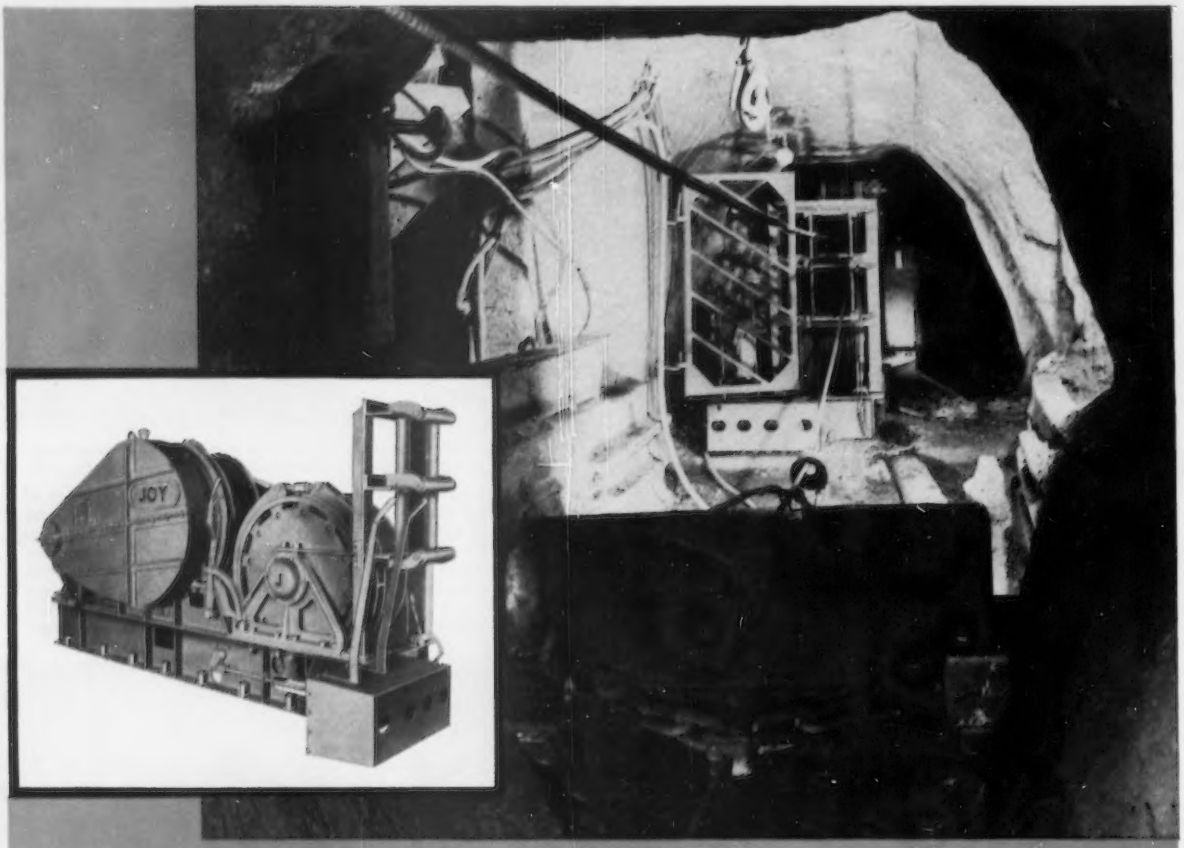
Tournatractor—Trademark TR-662-Q-b

For more information on either Rear-Dump or Tournatractor, please write or call:

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



BIG JOY EQUIPMENT is the PAYOFF at CLIMAX

A mining system built around the use of high-capacity, heavy-duty scraping equipment has been the payoff at Climax. Block caving into slusher drifts, which will accommodate a 6′ folding scraper, has resulted in a saving of up to half of the cost of gravity-chute ore collection methods previously employed.

The 150 HP Joy XT-221, a large tandem two-drum slusher with chain drive, is used at Climax for this high-capacity slusher operation. Many of these heavy-duty machines work on a three-shift basis yet with remarkably low maintenance. During the loading of the first 3 million tons of ore from the Storke Level at Climax by 23 Joy XT-221 Slushers, *the only repair charge was for clutch band linings.*

The Joy XT-221 is the largest model in a complete line of rugged scraping equipment expressly built for heavy underground duty. The line ranges from the 5 HP Model S-221 to 150 HP units such as the one illustrated above in a Climax drift, and includes models which will solve most scraping problems. For complete information on Joy Slushers, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 66-4

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS and BLOWERS WSW M-5737-66

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

Pit-and-Plant Housekeeping needs doing every day!

Your clean-up tasks pay no direct profits, but, if neglected, they can give you ore grading troubles, increase hauling costs, add to equipment-maintenance, and cause downtime that cuts production. One man and a modern motor-grader can do all these necessary "housekeeping" chores day-by-day . . . save expensive man-hours and production delays before the condition gets so bad it must be dealt with as an emergency involving costly repairs.

That is why we recommend the use of a modern Adams grader on a regular program of mine housekeeping. Here is a list of everyday assignments you probably include among your "housekeeping" problems:

1. **Haul-road maintenance . . .** saves tire-wear, speeds hauling, improves safety, keeps production rolling, cuts costs, increases profit.
2. **Clean-up of pit floors . . .** permits driving equipment by shortest route, saves wear on tires and crawlers, improves pit drainage, keeps dirt and refuse from weathering into lower levels of ore.
3. **Clean-up after blast . . .** the sooner scattered fragments from blast are moved back against toe, the safer for men, tires, and machines that move around your pit.
4. **Clean ore-benches of washed-down dirt . . .** the better your grade of ore, the better your price. Leaving silica and other washed-in debris on your benches invites it to wash into cracks, crevices, and drill holes in your ore. Prompt grader-service stops further "wash", piles the material for easy removal by scraper or truck.
5. **Keep concentrating-plant area clean . . .** safe to work around . . . drive around. There is occasional spill over the sides of heaped trucks, around conveyors, grizzlies, hoppers, trestles, and it pays to clean it up . . . daily. Keep roads, runways, and working areas around the plant neat, clean, and workable.
6. **Keep toes of stockpiles pushed in . . .** they contain valuable merchandise. Weather and loading operations tend to spread your stockpiles, eat up valuable workspace, waste stored material. To load from this thinly spread toe gives inferior grades, increases loading cost. A few minutes work with a motor-grader once or twice a week keeps your stockpiles clean, gives more work-room.
7. **Keep drainage open . . .** don't let puddles stand. Your pit area continually needs new drainage ditches. As old ditches fill, you need to clean them out. The best answer to ditch problems is the modern motor-grader. Watch an Adams grader work . . . you'll quickly see why a few hours a week with an Adams will keep your ditches clean and your pit dry.
8. **Level and spread on dumps . . .** means that trucks drive faster coming on . . . and faster off . . . safer, too. Adams spreads material clear over the edge with offset blade that reaches far out beyond leaning wheels that hold against side thrust. An Adams travels up to 25 mph . . . doesn't take long to get up on the dump, clean-up, and get back to the pit, working the haul-road both ways.
9. **In winter,** blade-grading of snow and ice quickly cleans pit and plant roads for safe, fast hauling. If there are drifts to lick, a V-plow attachment on your Adams grader helps open blocked roads quickly.
10. **For exploration teams,** a modern motor-grader to maintain haul-roads is a "must". Once heavy clearing is out-of-the-way, an Adams heavy-duty grader can build you a mile of well-graded-and-drained highway in a matter of hours.

It may be a good idea now to check your pit and plant housekeeping. Check, too, your available graders . . . compare them with the work-ability and versatility of a modern Adams. Perhaps it's time for a change? A new broom sweeps clean . . . a new Adams could revitalize your housekeeping program! Write for further information. And if you'd like reprints of this advertisement to use in discussing "housekeeping" with your staff, just tell us how many copies you need.

A size ADAMS for every need

Model 660—150 hp diesel engine, 27,730 lbs.
Model 550—123 hp diesel engine, 23,500 lbs.
Model 440—104 hp diesel engine, 21,500 lbs.
Model 330— 80 hp diesel engine, 20,500 lbs.

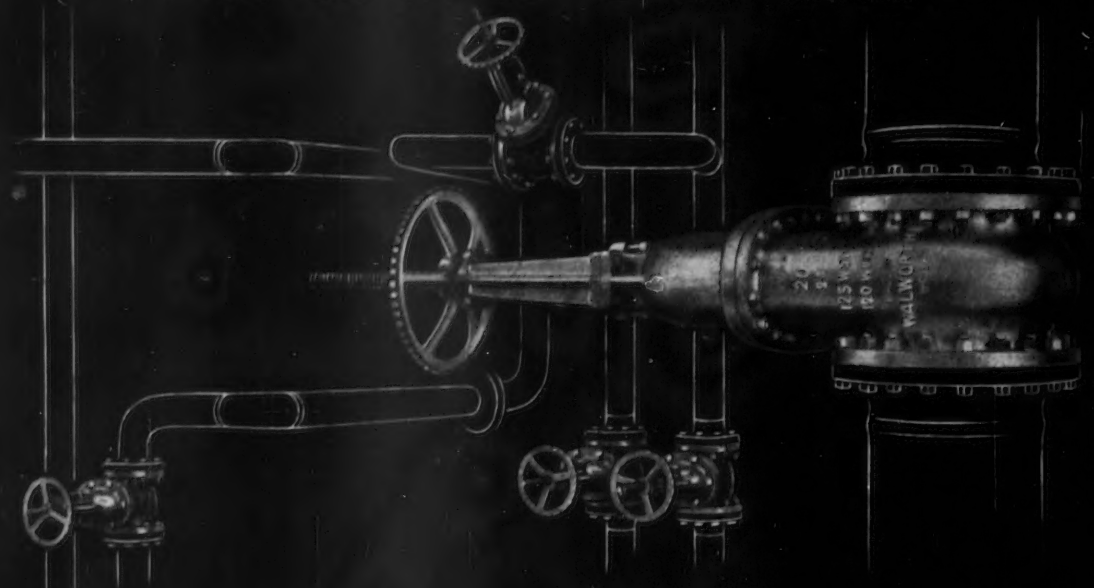
Adams optional equipment includes dozer blades, scarifier, snow plow, and snow wing

Good haul roads speed hauling, save tire wear and truck maintenance, improve safety. Adams graders do this work fast, at low cost.

AG-6-M-b

LeTourneau-WESTINGHOUSE Company
Peoria, Illinois
A Subsidiary of Westinghouse Air Brake Company

WALWORTH

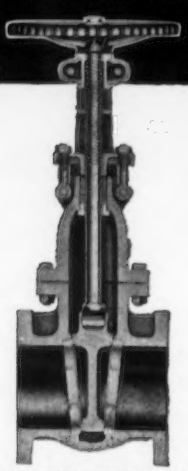


IRON BODY WEDGE GATE VALVES

Better because ...**The entire valve, from handwheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.**

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as ¼-inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

delivered...by THERMOID

This Thermoid conveyor belt is handling bauxite at an unloading dock in Baton Rouge, La. It was selected for maximum flexibility and resistance to loading impact.

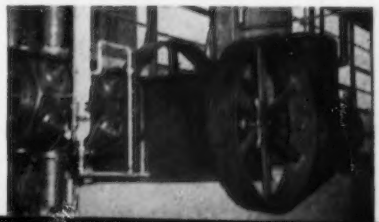
Whatever your materials handling job, there are Thermoid conveyor belts designed to meet your requirements. For example: Thermoid HT for extremely abrasive materials such as quartz ores, trap rock and coal . . . Thermoid A for highly abrasive materials: slag, lime rock, ore, ashes, hot cement and crushed stone . . . Thermoid C for moderate abrasives such as sand, loam and gravel.

Put belts like these to work on your conveyors. Get the long wearing advantages of Thermoid's exclusive impregnation process. It welds belt carcass and cover into a real brute for punishment! Thermoid's specially woven, finest quality reinforcement troughs easily—withstands shock loading like no ordinary belt can do.

Your Thermoid Distributor will be glad to help you select the conveyor belt that's right for your needs.

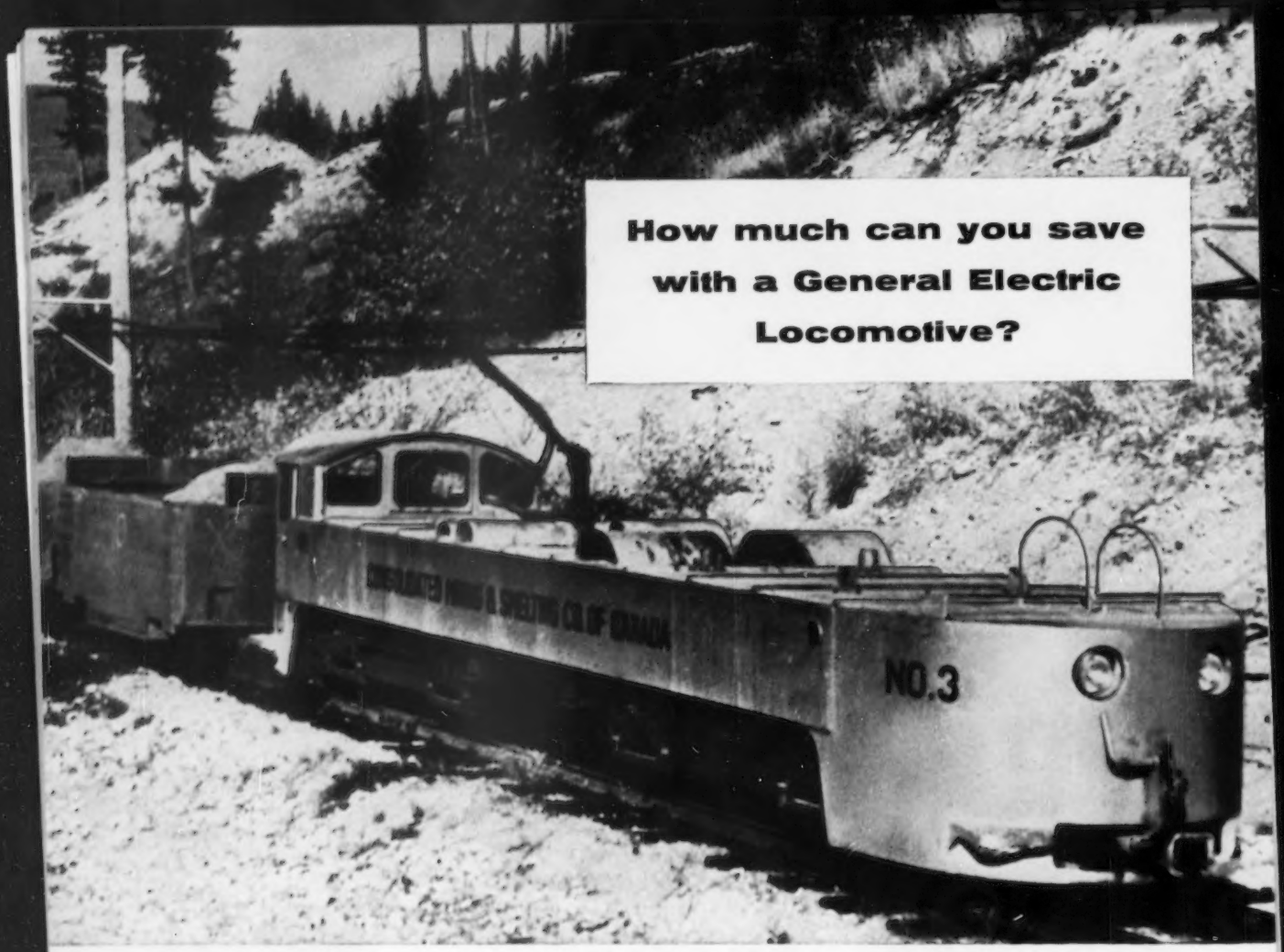
Thermoid makes many types of hose designed for specific mining applications. Quality construction saves hose dollars.

Maximum efficiency in power transmission is assured with long wearing matched sets of Thermoid Multi-V Belts.



Thermoid

THERMOID COMPANY, Trenton, N.J.



G-E Locomotives Help Consolidated Mining and Smelting Company Reduce Their Ore Haulage Expense

At Kimberly, British Columbia where the Consolidated Mining and Smelting Co. of Canada, Ltd. works the largest lead zinc mine in the world, three G-E 40-ton swivel-truck, trolley locomotives move about 11,000 tons of ore per work day—faster and at lower cost, too.

Designed for heavy duty, high-speed haulage, these powerful, swivel-truck mine locomotives have three outstanding advantages:

1. **Low weight per axle**—Locomotive weight is carried by four axles, thus reducing the concentrated load on the rails and decreasing the lateral forces imposed on the track.

2. **Short rigid wheel base**—The short rigid wheel base of the trucks, their low inertia, and their swivel connection to the locomotive frame permits the wheels to follow the rails freely. This reduces binding and straining on both the locomotive and the track.

3. **Short overhang at ends**—The long distance between the points at which the locomotive body is supported compared to the overhang at either end, prevents teetering or galloping and promotes smooth riding.

WHAT ARE YOUR HAULAGE REQUIREMENTS? From the wide range of G-E industrial and mine locomotives—diesel-electric and straight electric, for both underground and surface haulage, there's one that's fitted to your needs. For a survey of your haulage requirements, without cost or obligation, contact your G-E Apparatus Sales Engineer. Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. 120-79

You Get
Longer Life,
Better Performance,
Lower Cost
WITH ELECTRIC DRIVE!

GENERAL ELECTRIC

BUBBLE MEETS MINERAL!

Speed up this underwater pickup and your profits climb!

Armour flotation reagents compel the fastest attachments known —selectively float higher concentrations in less time for as little as 7¢ per ton!

The coating reaction between an Armour flotation reagent and the *specific* mineral you want is instantaneous. The Armour-treated minerals then attach quickly and firmly to rising air bubbles. As a result, you achieve a higher percentage of mineral recovery—along with increased throughput. You use less equipment, too, because the sharp selectivity of Armour cationic flotation reagents enables you to recover minerals without using an extra cleaner flotation step. And you can float the minerals from one ton of ore for as little as 7¢!

Armour produces a wide range of both cationic and anionic flotation reagents. For information and samples, send the coupon at right. Or write us, if you have a specific separation problem. Whether you want to float your minerals to concentrate them or reject them, we can suggest an Armour flotation reagent which will float more of the exact minerals you want *one by one*—in less time and at less cost.

PROVEN SEPARATIONS

Amblygonite • Barite • Beryl • Cement Rock
Chromite • Feldspar • Fluorspar • Hematite • Ilmenite
Kaolinite • Manganese • Mica • Phosphate • Potash
Salt • Scheelite • Silica • Spodumene • Syenite
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For test samples and information on how Armour flotation reagents can increase *your* recovery percentages, describe briefly the separations in which you are interested and send this coupon to the address below, today.

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E 3

Specialists in Flotation Chemicals

ARMOUR CHEMICAL DIVISION

© Armour and Company, 1355 W. 31st., Chicago 9, Ill.

Top protection for baghouse operation

with

Honeywell Instrumentation

Temperatures and pressures for a typical baghouse installation are controlled by Honeywell instrumentation as diagrammed here.

UP-TO-DATE Honeywell instrumentation can make the task of collecting dust from mineral beneficiation processes highly efficient and thoroughly automatic. It can keep the baghouse operating within prescribed limits . . . help to reduce loss of valuable product in flue gases . . . eliminate sources of excessive wear and maintenance in plant equipment . . . and maintain working conditions that spell maximum safety and comfort of employees.

Honeywell instrumentation includes automatic, interlocked control of temperature and pressure. As shown in the diagram, an *ElectroniK* instrument regulates a tempering air damper to hold constant the temperature of gases flowing to the baghouse. Should flue gases become excessively hot, more tempering air is automatically fed to the mixture, to protect the bags against burning or gumming.

Buildup of back pressure across the bags is prevented by means of a Brown differential pressure controller, which actuates automatic shaking mechanisms when preset limits are reached. Pressure control is interlocked with temperature control to maintain the proper pressures in roasters or smelters.

Engineered to the individual requirements of your own dust collecting equipment, Honeywell instrumentation embodies the utmost in dependability and precision. Design features are based on many years of experience in developing and supplying controls for the metal producing industry. For a discussion of your specific problem, call your local Honeywell sales engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

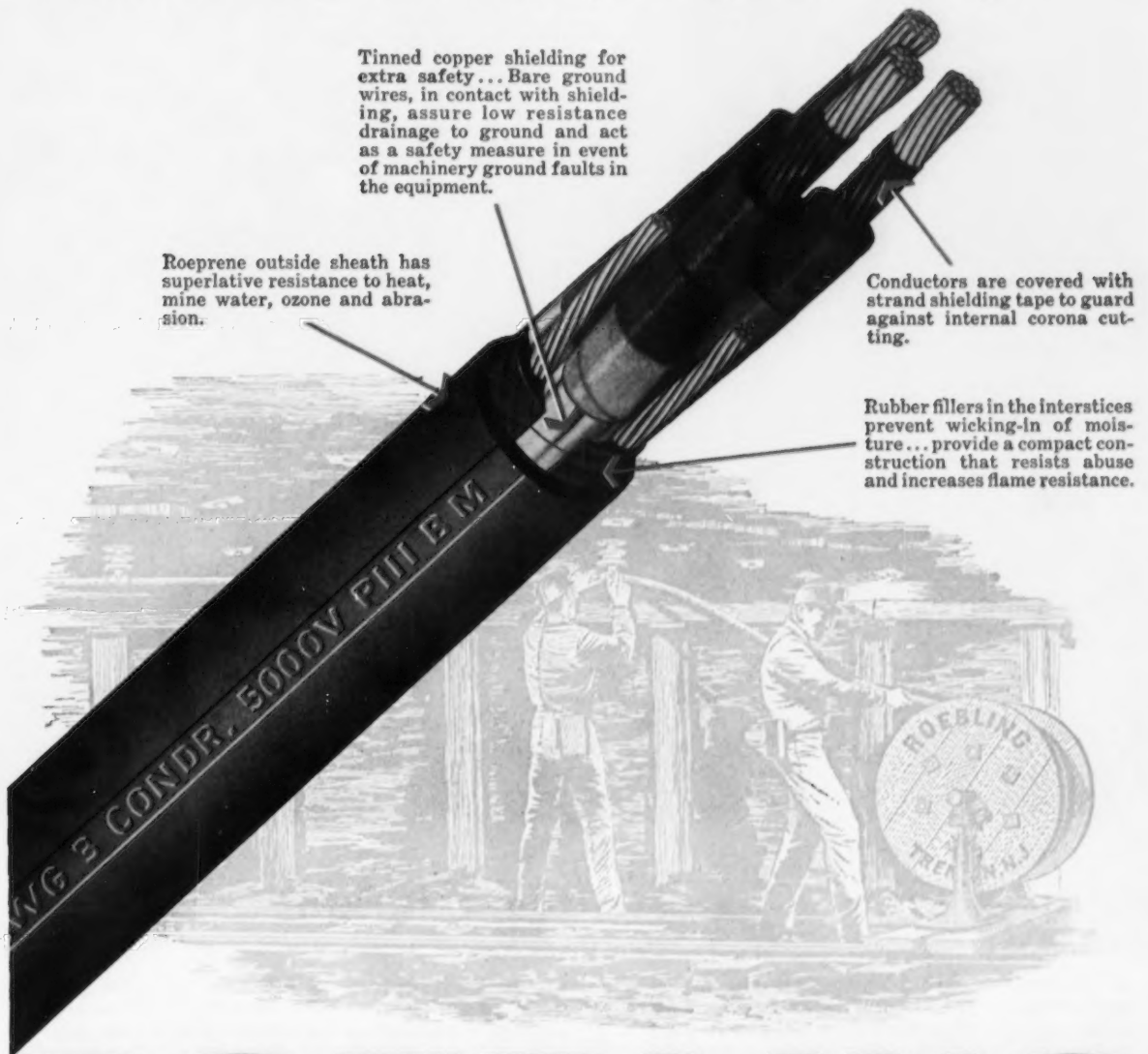
● **REFERENCE DATA: Write for Catalog 1531, "*ElectroniK* Controllers" . . . and Catalog 7001, "Pressure and Vacuum Gages."**

MINE POWER FEEDER CABLE

TODAY'S TOP SPECIFICATION FOR MINE POWER DISTRIBUTION

NON-METALLIC ARMORED . . . shielded . . . Roebling high-voltage Mine Power Feeder Cable is perfectly adapted for practically every sort of power distribution requirement. You can suspend it vertically in shafts or boreholes; run it horizontally in underground entries or suspended from insulators. Since its outer sheath has high resistance to moisture, abrasion and other service hazards, you can safely bury it direct in shallow trenches.

Roebling Mine Power Feeder Cable has every construction feature that assures maximum safety, dependability and service life. Classified as semi-portable, it is exceptionally easy to move and handle under all conditions. Get complete information on Roebling Mine Power Feeder Cable from your Roebling distributor or by writing us.


Tinned copper shielding for extra safety... Bare ground wires, in contact with shielding, assure low resistance drainage to ground and act as a safety measure in event of machinery ground faults in the equipment.
Roeprene outside sheath has superlative resistance to heat, mine water, ozone and abrasion.
Conductors are covered with strand shielding tape to guard against internal corona cutting.
Rubber fillers in the interstices prevent wicking-in of moisture... provide a compact construction that resists abuse and increases flame resistance.
3 CONDR. 5000V PILC M
ROEBLING

ROEBLING

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Shuttles underground *without turning*

There's no room to turn in this mine tunnel — and no need to turn. Koehring Dumptor drives up to the tractor-shovel, body forward, gets its load — and then shuttles back out of the tunnel at the same speed as it entered. Dumptor operates with equal ease in either direction. It gets this no-turn operating advantage through a constant-mesh transmission that gives the same 3-speed travel forward and reverse. Dumptor no-turn hauling has gained wide acceptance in both underground and strip mining, as shown on these pages. It solves problems of operating along overhead trestles, on open-pit ledges, narrow haul roads — is especially practical for stockpiling. There's an important production advantage, too. Every turn eliminated cuts 15 seconds off cycle time. This adds up to a substantial increase in yards or tons hauled per hour. For example — by saving only 2 turns on a round trip, time studies prove that Dumptor often increases hourly yardage output more than 10% on an average 1000-foot haul. Better have your Koehring distributor show you what Dumptor no-turn hauling can mean on your mine, quarry or stockpile operations. He has some facts and figures that will interest you. Call today.

Elevated haul-way — On extensive stockpile operation, Koehring 6-yard Dumptor shuttles along overhead trestle. It travels from mine headshaft to edge of stockpile, dumps, and returns for next load — never turns. This trackless method replaced lorry cars at several mines. Some Dumptor owners set up access ramps, instead of using trestle systems.

Dumps in one second — Dumping off end of hillside trestle, operator drives up to hopper, trips the body-release lever, and *gravity* dumps the 6-yard load instantly. One second later, Dumptor is on its way back. There is no 15 to 25-second wait for slow-acting body hoists. Koehring *gravity-dump* works every time — never balks, and never wears out.

Big production team — Working with Koehring 1½-yard shovel, Koehring Dumptors are loaded with body forward, ready to travel and dump without turning. These heavy-duty haulers have better than 6 h.p. for every ton of loaded weight — accelerate fast, pull through soft ground, up grades and ramps with less shifting — climb 24% grades fully loaded.

Stockpile specialist — Dumptor puts stockpiling on a fast shuttle-haul basis — eliminates turning at the loader and on top of the pile. Notice how instant dumping action kicks the load out over edge of pile — saves a lot of dozer clean-up. Free-swinging kick-out pan breaks load suction in wet materials, bolts down to floor when handling rock.

KOEHRING COMPANY, Milwaukee 16, Wis. Subsidiaries: PARSONS KWIK-MIX • JOHNSON KOEHRING HEAVY DUTY 5644

how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job.* Generally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits – important where smaller rod sizes are used.

Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a ⅞″ hexagon alloy rod when you've been using a 1¼″ round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods – in the sizes, shapes, and grades you need – Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

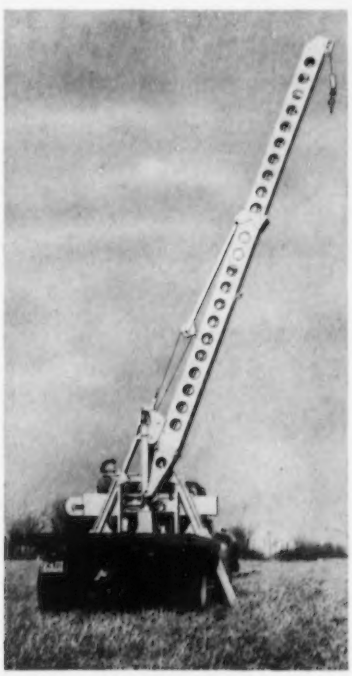
Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST

LLOYD E. ANTONIDES, Assistant Editor

Impact Wrench (1)

Simple yet precise control of torque setting is claimed for air-operated Torque Control Impactool by Ingersoll-Rand Co., New York, N. Y. They say development parallels invention of Impactool itself. Splined torsion bar has calibrated collar which is set to desired reading by small jig in few seconds. Action of mechanism shuts off machine when nut running resistance is equal to stress preset on torsion bar. During run-on of nut, wrench runs at normal full speed until desired nut resistance is reached. Action is likened to pogo stick bouncing on soft ground and then suddenly striking hard surface. Operation is reversible. Two sizes are available. Large one, 350 to 550 ft-lb, is shown.



Truck Crane (2)

Model 60 Hydra-Lift crane by Pitman Mfg. Co., Kansas City, Mo., has boom which can telescope 10 ft while lifting full 6,400-lb capacity load. Unit requires only 40 in. behind cab of any 2-ton or larger truck, telescopes hydraulically.

Roller Cone Rock Bit (3)

Three cone rotary Seismaster rock bit offered by Central Mine Equipment Co., St. Louis, Mo., features replaceable cones, conventional lubrication fittings and better protection to cone bearings. Since failure of bearings is especially guarded against, skewing or freezing of cones is eliminated and thus, it is claimed, hole diameter loss is negligible. Company says retipped standard cones last only 30 to 35% as long as new ones so they find it's more economical with their free-turning expendable design, to run cones to exhaustion.

Water Pump

Russian principle is being used in valveless pump seen in East Germany, according to McGraw-Hill World News. Length of rubber hose is intermittently pressed by roller on end of rotating arm. No other information is available.

Liquid Filter (4)

Hydra-Shoc, compact tubular filter of Industrial Filter & Pump Mfg. Co., Chicago, Ill., uses air, compressed by liquid flow, to knock cake from tubes and out bottom drain at end of cycle. It's called highly efficient and low cost.

Roller Mill (5)

Particularly suited for grinding relatively soft material, Disc Roll mill by Hardinge Co. Inc., York, Pa., is an improved German development. Two stationary flat wheels roll on rotating horizontal disk, onto which ore is fed. Ground material flows over outer rim into air stream and up into Gyrotor air classifier. It can grind to from 20 to 325 mesh but is best for 70 to 90% minus 200.

Tractor-Loader (6)

Traxcavator No. 977 by Caterpillar Tractor Co., Peoria, Ill., takes a big bite with its 2¼-cu yd bucket. Especially with its ability to heap loads gained through a 40 deg. bucket tip back at ground level. Operator visibility is said to be enhanced by higher seat and lower tilt cylinders. Bucket is held in any tilt position by hold-positioner, freeing operator's hands for other controls. Long tracks are said to give good stability.

Bit Detacher (7)

Used to detach slip-on bits from drill steel, BD-282 unit made by Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis., now has plate covering bit and end of steel. It prevents injury from chips.

Hardfacing (8)

Improved heat, vibration and corrosion resistant properties are claimed for No. 70 hardfacing alloy. Ideal for cement screws, pump parts and engine valves says Wall Colmonoy Corp., Detroit.

Radio Aid (9)

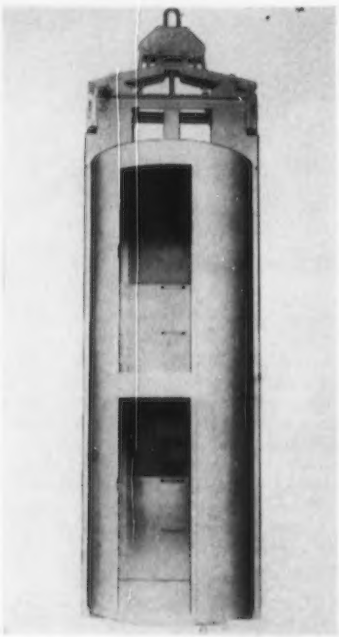
Distracting and annoying chatter on two-way radios is eliminated by device which turns on individual receivers with selective tone. It is called Personal Channel system by G. E., Syracuse, N. Y.

Castable Refractories (10)

Flint Cast 29, high strength castable refractory about twice as strong as regular, and 30, medium strength with service limit of 3,000 deg. F, are announced by Robinson Clay Product Co., Akron.

Rock Drill (12)

Thor Power Tool Co., Aurora, Ill., announced Model 77, 55-lb rock drill which features a recently developed latch type front head which gives positive lock for pulling drillsteel when used on airleg.

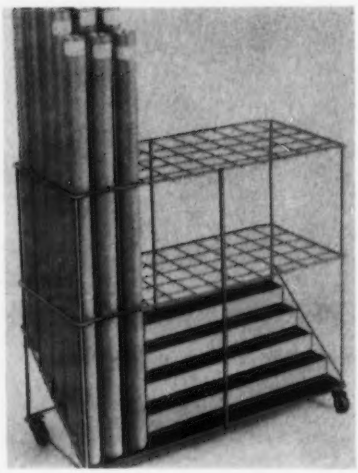


Man Cage (13)

Custom built man cage by Connellsville Mfg. & Mine Supply Co., Connellsville, Pa., is part of push-button elevator type "package" installation for use in circular shafts.

Conveyor Belting (11)

Solarflex hot material conveyor belts remain pliable and elastic even when exposed for long periods to baking temperatures up to 350 deg. F, says B. F. Goodrich Co., Akron, O.



Map Rack (14)

Frontier Mfg. Co., Dallas, Texas, introduces handy map rack. Wire grid keeps map rolls separated. Stepped effect of base permits easy reading of index labels. It comes on casters.

from Asbestos to Zinc...

ASBESTOS
ANTIMONY
CEMENT
CHROMIUM
COPPER
DOLOMITE
FELDSPAR
GOLD
GRAVEL
IRON ORE
LEAD
LIMESTONE
MANGANESE
MOLYBDENUM
NICKEL
NITRATE
POTASH
REFRACTORIES
SILVER
SLAG
TACONITE
TIN
TITANIUM
TUNGSTEN
URANIUM
VANADIUM
ZINC

SYMONS® CONE CRUSHERS

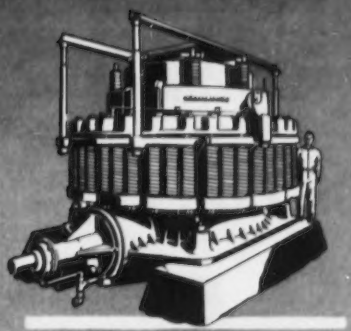
are the leading choice for large volume production of finely crushed material at low cost

In all of the great ore and industrial mineral operations throughout the world, ranging from Asbestos on through Zinc, Symons Cone Crushers have consistently aided man by making possible the efficient reduction of these materials to meet growing demands.

Continual repeat orders for Symons Cones from the world's leading ore and mineral producers conclusively establish this fact.

Whenever *you* are confronted with high capacity fine reduction crushing problems, it will pay you to investigate the advantages of Symons Cone Crushers . . . *the machines that revolutionized crushing practice.*

Nordberg Mfg. Co., Milwaukee, Wis.



• SYMONS Cone Crushers are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to over 900 tons per hour.

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Symons Gyratory Crushers

Grinding Mills

Mine Hoists

Vibrating Bar Grizzlies

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STAYS ON THE JOB LONGER

Rugged body and frame withstand the impacts of loading, hauling and dumping heavy excavation in construction, mine and quarry service.

SPEED AND STABILITY

The 5-speed transmission and Euclid planetary axle provide top speeds with full payload up to 27 m.p.h. Free-floating Euclid spring suspension gives maximum stability empty or loaded under all road conditions . . . permits faster safe travel speeds.

18-ton payload with 16.00 x 25 tires

Outstanding

FEATURES

- **30,000 lb. payload with 14.00 x 24 tires**
- **10½ yd. body**
- **218 h.p.**
- **hydraulic booster steering**
- **air assist clutch**

Here's the New R-15 "Euc"

that sets a new high in 15-ton Rear-Dump Performance!

For over 20 years 15-ton Rear-Dump "Eucs" have paced the field in mine, quarry and construction work. They've delivered "plus" performance year in and year out on hundreds of the toughest jobs.

This Model R-15 incorporates the engineering advances, easy operation and maintenance features resulting from unequalled field experience with other Euclids of the same capacity. Dependable work-ability means more payloads per day at lowest cost per ton or yard moved.

Have your Euclid dealer give you the full details on this new 15-ton Rear-Dump and the complete line of Euclid earth moving equipment. He'll be glad to show you why so many users have proved for themselves that ***Euclids are your best investment.***

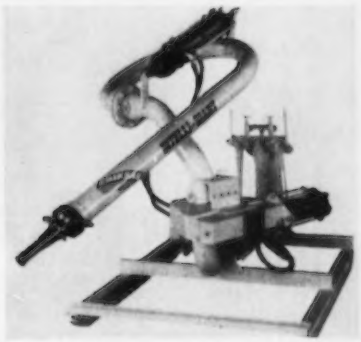
EUCLID DIVISION, General Motors, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

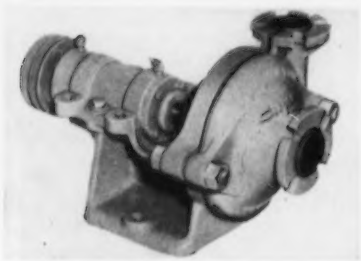
Safety Goggle Aid (15)

Throw-away unit offered by Pulmosan Safety Equipment Corp., Brooklyn, N.Y., contains spray of anti-fog and cleaner solution as well as wiping tissues and used tissue disposal space. The solution both "Stops Fog" and cleans in one application. Wall bracket makes simple mounting for placing in any strategic location. It also aids "house-keeping."



Hydraulic Monitor (16)

Hydraulic controls permit easy one-man operation of Intelli-Giant MH-4, new hydraulicking unit made by Chicksan Co., Brea, Calif. The water monitor uses a 4-in. supply pipe and barrel and is capable of shooting a 300-ft stream through a 2½-in. tip at 2000 gpm. Controls use water pressure for power. Remote operation is possible.

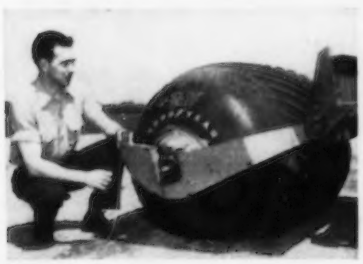


Solids Handling Pump (17)

Rubber lined solids handling pumps developed by Warman in Australia are now being made by Carpco, Jacksonville, Fla. First size available is 1-in. x ¾-in.; up to 8-in. x 10-in. will be available soon. It requires no sealing water yet has good suction lift, it is said. It is recommended for continuous duty applications on corrosive and abrasive slurries.

Vibratory Screen (18)

Eccentric motor makes compact driving element for fine screening unit made by Derrick Mfg. Co., Buffalo, N.Y. High frequency and small amplitude is said to give close screen contact for maximum capacity with minimum wear. Motor operates at 3600 rpm normally, can go to 5000 rpm for special requirements. Construction is lightweight.



Mobile Tank (19)

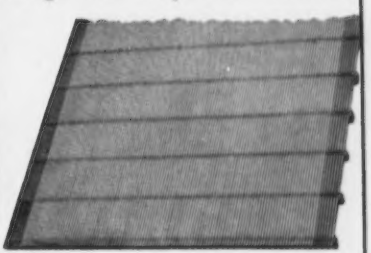
Rolli-Tanker of Goodyear Tire & Rubber Co., Akron, Ohio, is a watermelon shaped rubber tank, 3½ x 5 ft, fitted with hubs and axles for easy towing. It is designed for rugged use in transporting and storing bulk liquids.

Drafting Instrument (20)

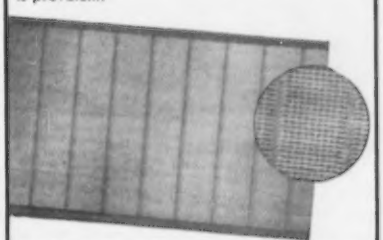
K-Square unites T-square, triangle and ruler into one easy-to-use drafting tool. Retailing at low-cost, it is claimed to be highly accurate. Inventor is 16-yr old Lawrence Kalmis, high school senior and Junior Achievement member.

Buy Valuable long life and economy that you can actually SEE...

Kleenslot
REG. U.S. PAT. OFF.
Wedge Wire Preparation Screens



WEDGE WIRE ALUMINUM SCREENS: They have all the attractive and sturdy features of many other metals besides aluminum and offer a flexing action that adds capacity and dewatering abilities which are almost unbelievable. It gives a distinct advantage where vibration is prevalent.



MARCEL TYPE SCREEN! This screen, as all WEDGE WIRE products, gives long life and non-blinding operation. Maximum dewatering efficiency is combined with a wavy type of screen preventing objectionable slivers passing through. This keeps the end product uniform.

Wedge-Wire
CORPORATION
Gas Street at Nickle Plate R. R.
Wellington, Ohio

Stoper (21) ►

Lightweight stoper, S-10, has faster drilling speed than heavier models according to Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis. An all aluminum airleg is used. Available in 26-, 32- or 38-in. feeds, the 26-in. model weighs only 79 lb. End-seating valve is reputed to give faster speed through more powerful blow and rotation.

◄ Air Hammer (22)

Model 15, 15-lb utility air hammer made by Thor Power Tool Co., Aurora, Ill., can be used as rock drill or chipping hammer. Newly developed stop rotation feature is controlled by simple lever. Either wet or dry drilling models are available. It is 17¼ in. long, cuts holes up to 1⅝-in. diameter. Chuck is for ⅞-in. hex; hose used is ⅜ in.

Radon Gas Sampler (23)

Utah Juno, radon gas survey unit, has been designed to meet safety regulations of Utah Industrial Commission aimed at safeguarding health of uranium miners. Developed by Atomic Engineering Corp., Grand Junction, Colo., the radiation counter is easily handled while taking air samples in checking for adequate ventilation.

Vibrating Screen (24)

Hewitt-Robins Inc., Stanford, Conn., claims HS Virex vibrating screen is 30 to 80% faster than previous mechanical units. For fine wet or dry screening of sand, asbestos, fertilizers et al., it has speed of 3300 rpm when set for 1/32-in. stroke. Since it handles most materials at only 10 to 15 deg inclination, headroom is lower. Lubrication is by oil mist.

Slide Rule (25)

Green yellow color of slide rules made by Pickett & Eckel Inc., Alhambra, Calif., cuts eyestrain and gives good sharp reading. Made of lightweight alloy, they do not warp or rust and are finely calibrated. Standard 6- or 10-in. rules as well as special made-to-order ones are offered. The non-glare color permits eye to focus more precisely.

Truck Suspension (26)

Air-filled rubberized bellows are basis of air suspension system replacing metal leaf springs on GMC heavy trucks. According to GMC Truck & Coach Div., General Motors Corp., Pontiac, Mich., they eliminate lubrication, absorb shock and vibration better, and maintain truck bed at constant height. Compressed air for bellows comes from air brake system.

Air & Water Hose (27)

Super-Master BW hose by Manhattan Rubber Div., Raybestos-Manhattan Inc., Passaic, N.J., has braided wire construction with bright yellow cut-resistant cover. The company says it's tough enough for most severe service on heavy machinery yet light and flexible enough for air tools. Neoprene tube withstands oil and cover has high visibility.

Welding Machine (28)

MF semi-automatic welder by Amsco Div., American Brake Shoe Co., Chicago Heights, Ill., is designed for manganese steel and hardsurfacing work on irregularly-shaped parts and can do more conventional work too. Arc governs automatic feed of wire electrode. Powdered flux feeds through funnel.

Geophysical Instrument (29)

Magnetic susceptibility meter, MS-160, by Mt. Sopris Instrument Corp., Boulder, Colo., can be used in field on rocks in place or in laboratory on small samples. A three coil sensing element is employed to minimize errors on irregular rock surfaces. It helps in planning any magnetic survey.

Packing (30)

Flexrock process packing of Flexrock Co., Philadelphia, Pa., has been developed to solve the problem of stocking a countless array of different size, shape and type of packing. They say in most cases one size and type is all that is needed. It is self-forming and self-lubricating, and comes in coil or bulk form in either of two formulations.

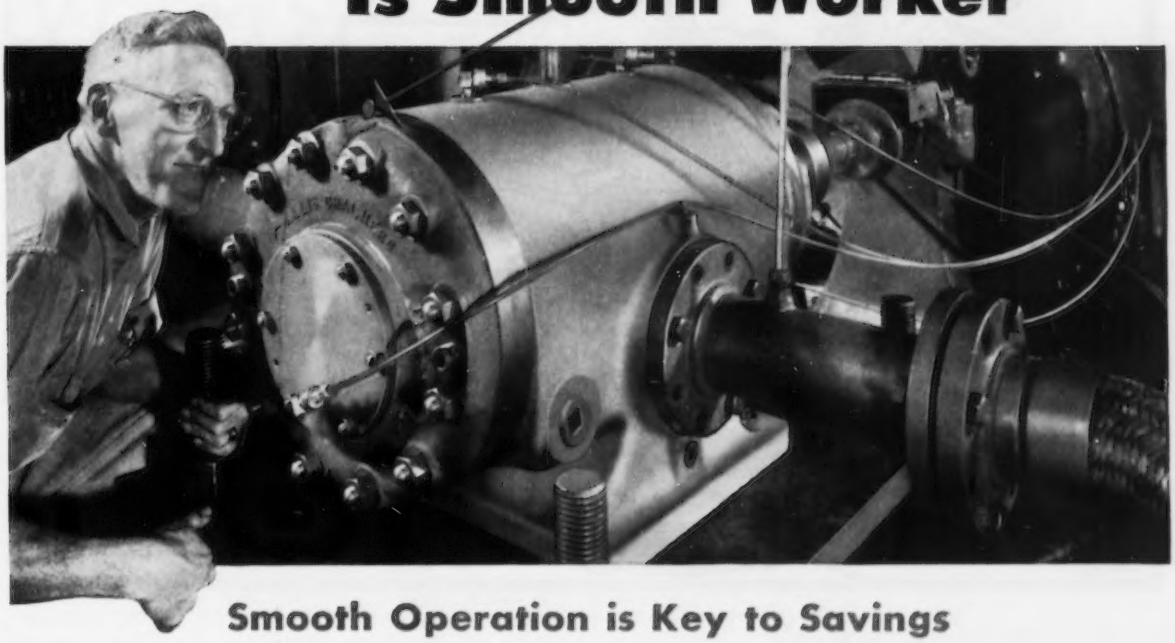
Lubrication System (31)

Alemite Div., Stewart-Warner Corp., Chicago, Ill., announces a centralized lubrication system for vehicles or equipment powered by internal combustion engines. It automatically delivers a controlled measured amount of lubricant to as many as 30 points each time engine is started. It consists of a vacuum operated pump, tubing and valves.

Coagulant Aids (32)

Designed to speed up water clarification processes, chemical aids to aluminum and iron coagulant compounds are announced by Hagan Corp., Pittsburgh, Pa. They also extend pH range and can help in lime-soda softeners. Three compositions are available—Nos. 7, 11 and 18—to fit particular water, clarifier or softener.

Coin Trick Proves
RO-FLO COMPRESSOR
Is Smooth Worker



Smooth Operation is Key to Savings

Everybody around the place knew the *Ro-Flo* compressor was a smooth operator. But just how smooth?

Someone suggested the old coin trick . . . balance a coin on it while it's running.

The next we knew the foreman was calling, "Come down and see for yourself." We went to the shop. And sure enough, there the penny was standing as still as you please.

What does that mean to you?

It means, here's a compressor that needs practically no foundation. And it means there's no wear and tear from vibration...less maintenance.

You get constant air supply with this machine, too. For this story: Call your nearby A-C office for complete information, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

A-4716

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Ro-Flo compressors provide constant efficiency and air supply for air tools

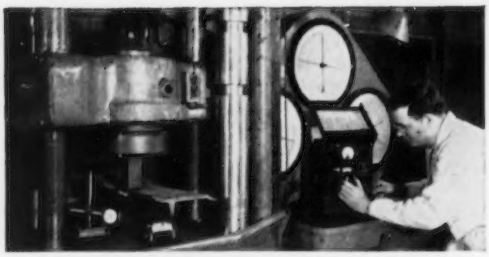
Biggest reason for using only Caterpillar original parts in your machine is a reason you cannot see or feel. It is the *ancestry* of Caterpillar parts.

Behind each and every CAT* replacement part is the experienced engineering, painstaking research, grueling testing, skilled manufacturing and rigid inspecting which make Caterpillar products the standard of the industry. With these truly "pedigreed" parts you can be sure of better all-around performance, less down time.

With substitute parts, can you be sure of anything?

See your dealer's Parts Representative — get Caterpillar original parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



Special gauge measures exact amount of strain a part can endure. Constant testing like this guarantees that all parts are made to the highest Caterpillar standards. Why be satisfied with anything less?

CATERPILLAR*

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NEW PRODUCTS DIGEST *(Continued)*

PIPE with a built in steam line can solve the problem of applying heat to piping. Made of aluminum, it is lightweight and rust-proof. Alcoa, Pittsburgh, Pa., calls it Unitrace. It has cresent shaped segment for steam. (33)

SAFETY GOGGLE lenses of Armorlite hard resin are light weight, fog resistant and extremely shatter-proof. An interesting account of testing by firing a shotgun at it is given by Armorlite Lens Co., Pasadena, Calif. The material can be prescription ground. (34)

LUBRICATOR for the wheel flanges of rail equipment is offered by Transall Inc., Birmingham, Ala. Consisting of simple, non-wearing holder for feeding stick lubricant, it is said to cut maintenance costs. (35)

WELDER made by Lincoln Electric Co., Cleveland, Ohio, has integral gasoline engine power unit. Designed for use wherever general power is not available, it's called Weldanpower because it can also be used as an emergency 4 kva standby ac power unit. Welder is 200 amp unit. (36)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

EXPLOSIVES Handling & Use are presented in revised list approved by Institute of Explosives Makers. Four page folder offered by Atlas Powder Co., Wilmington, Del., gives "Do's and Don'ts", shows how to make primer, and lists other publications available. (37)

DRAFTING time-saving techniques using "intermediates"—any translucent- based reproduction of an original drawing that serves as master in print-making—are concisely explained and shown in booklet from Frederick Post Co., Chicago, Ill. (38)

WIRE ROPE in drilling operations is subject 60-page pocketsize handbook prepared by Jones & Laughlin Steel Corp., Pittsburgh, Pa. Selection, use and care of wire rope in oil, gas and water well drilling operations are given. (39)

WIRE ROPE splicing and fitting is explained in clear and well illustrated 32-page booklet offered by E. H. Edwards Co., S. San Francisco, Calif. Methods are detailed step-by-step. End fitting efficiencies are listed. (40)

DRIVES for powered industrial equipment are treated in quarterly publication, "Production Road", of Twin Disc Clutch Co., Racine, Wis. Case histories and other mechanical power transmission tips are presented well. Torque convertors on shovels is covered in one article in No. 4, Vol. 17. (41)

ION EXCHANGE topics are covered in periodical from Rohm & Haas Co., Philadelphia, Pa. December 1955 issue briefly dealt with uranium ore treatment. (42)

DREDGE PUMP maintenance and selection are discussed in bulletin describing GA and GAF models made by Morris Machine Works, Baldwinsville, N. Y. (43)

WIRE ROPE & CHAIN FITTINGS are shown in 28-page catalog issued by Thomas Laughlin Div., American Hoist & Derrick Co., St. Paul, Minn. Each item of the complete line is pictured along with strengths, etc. (44)

ELECTRICAL APPARATUS & MOTOR controller renewal parts for all brands are cataloged by Brownell Distributors Inc.., Atlanta, Ga. for the first time they say. Price list insert is included in the 96-page illustrated catalog. (45)

INSULATED ELECTRICAL CABLE made by Hazard Div., Okonite Co., Passaic, N.J., is presented in attractive 48-page data book. Considerable basic design instruction is given. (46)

MINE FANS is title of catalog issued by Jeffrey Mfg. Co., Columbia, Ohio. Ventilation equipment described and illustrated embraces wide variety of fans and blowers. It contains good section on planning ventilation. (47)

TRACK SWITCH STANDS and accessories for standard and narrow gauge service are shown in catalog compiled by Bethlehem Steel Co., Bethlehem, Pa. (48)

HOSE COUPLINGS & NIPPLES for rubber hose made by LE-HI Div., Hose Accessories Co., Philadelphia, Pa., are covered in 4-page bulletin. It gives complete data on steel, brass and malleable iron fittings. (49)

ROOFING & SIDING of corrosion-resistant porcelain enameled corrugated steel called V-Corr, and made by Toledo Porcelain Enamel Products Co., Toledo, Ohio, is described in brochure. Installation and design data is given. (50)

LOG WASHERS are subject of 8-page bulletin issued by McLanahan & Stone Corp., Hollidaysburg, Pa. Construction, operation and dimensions are given. (51)

MARCH 1956

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So — he can shoot a few holes or a few acres with one detonator. And he can fire when ready, because Primacord is insensitive to ordinary shock, friction, sparks or stray electrical currents — and even a direct hit by lightning failed to detonate it. Available in Plain, Reinforced, Plastic Reinforced and Plastic Wire Countered.

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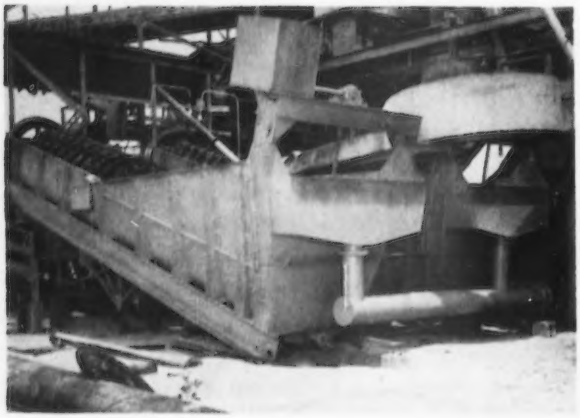
AKINS...first in EXPERIENCE

used since 1908 for efficient, low-cost classification

TYPICAL CASE HISTORY: **Pioneering in Phosphate**

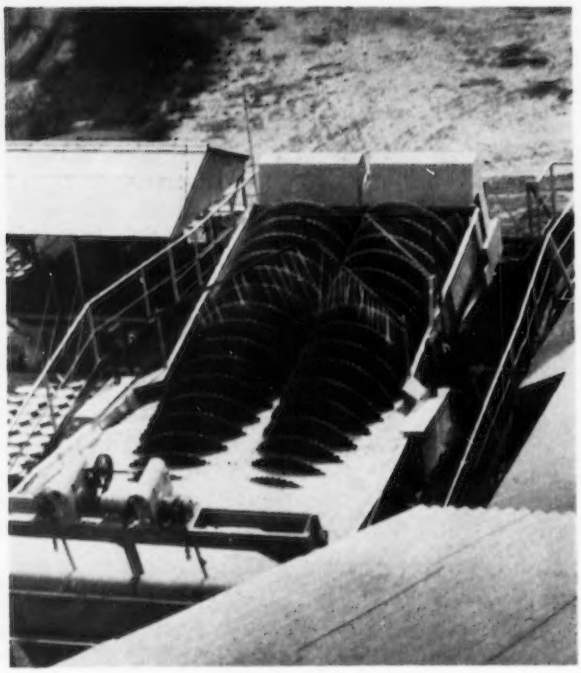
In cooperation with the phosphate mining companies, Colorado Iron Works engineers applied their specialized classification experience in helping to solve the problems associated with developing efficient treatment of phosphate ores. Akins dewatering, deoiling and desliming classifiers were among the first used in this field. Having proved their efficiency Akins Classifiers predominate the phosphate field.



1944

...2 Akins for Swift and Company's Watson Mine, one of first classifier installations on phosphate.

These 2—54" Akins Simplex Classifiers, installed in 1944, and 2 others purchased later, are dewatering and desliming + 150, — 35 mesh flotation feed.



1956

...8 Akins at Armour Fertilizer Works' New Plant, Bartow, Florida.

This recent installation includes 1—78" Duplex Akins, 1—66" Duplex Akins, 1—60" Duplex Akins, 1—66" Simplex Akins, and 4—60" Simplex Akins. They are being used for dewatering flotation feed, flotation concentrate, belt feed, belt concentrate, and for primary and secondary deoiling.

There are now 28 Akins operating successfully in 8 phosphate plants.

AKINS . . . the Original Spiral Classifier*

*A Registered Trademark of C.I.W.

COLORADO IRON WORKS CO.

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SPECIALISTS IN CLASSIFICATION FOR 48 YEARS

Gardner-Denver . . . Serving the World's Basic Industries

Gardner-Denver 125-foot portable at entrance to Utah uranium mine. Supplies air for drilling within the mine.

"Cash in" quicker on uranium with Gardner-Denver quality equipment

Whether you're in the exploration, development or production stage, Gardner-Denver rock drills, air compressors and other mining equipment can help you get the work done faster. Quality products, engineered by Gardner-Denver and proved in mining enterprises all over the world, assure the dogged dependability you need in out-of-the-way locations. Low operating and maintenance costs can stretch your "stake" further—increase your profits.

Send for bulletins on Gardner-Denver portable or skid-mounted compressors, drilling equipment for deep test holes, sinkers, drifters, stopers, air hoists, mine car loaders.

S-48 sinker and air feed leg — a lightweight, fast-drilling combination.

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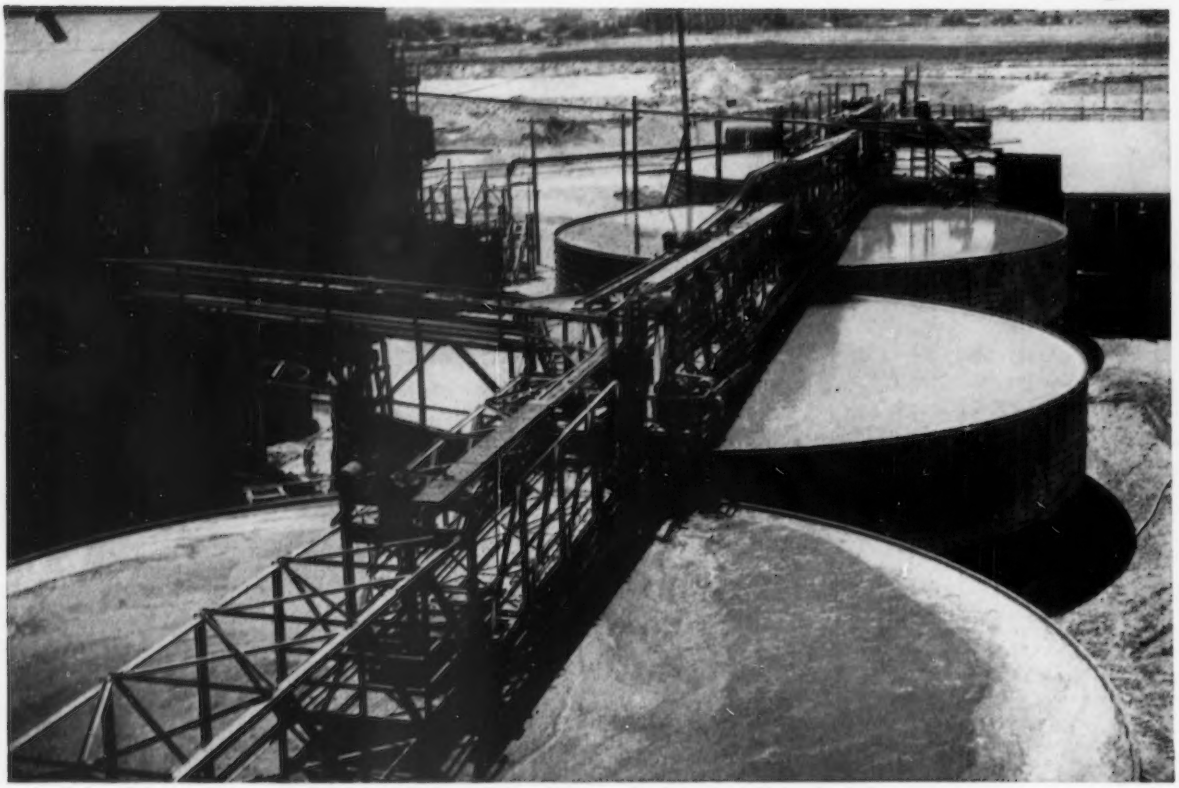
DOW



A typical mining operation using Separan 2610 to obtain uniform and rapid liquid-ore separations.

FLOCCULATING POWER, EASE OF USE, ECONOMY, CREATE BIG DEMAND FOR SEPARAN 2610

Outstanding new efficiency can be brought to settling and filtration operations. That's the reason for the soaring demand for Separan* 2610. Exciting case histories are piling up.

One Thickener for Five

One uranium ore processor was able to eliminate four of his five thickeners with the addition of Separan 2610. Two banks of filters and several earthen ponds were also no longer needed. The savings? Nearly $3000 per day. In another uranium mill, production was at 50% of capacity due to low filtration rates. But when 0.2 pound of Separan 2610 per ton was added, the filtration rate doubled—and so did production!

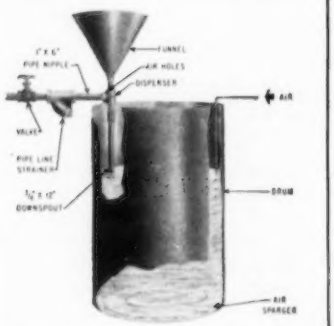
Settling Faster, Filtration Better

The advantages of using Separan 2610 are numerous. Overhead clarity is increased, materials lost in overflow decreased. In filtration, this synthetic non-ionic polymer increases cake weight per unit area of filter and reduces moisture content. Washability is increased, the cake is more homogenous and easier to handle.

Dow Xanthates—Dowfroth 250

Separan 2610 is the latest addition to the Dow family of chemicals for mining. Dow Xanthates, the collectors to use in all flotation of sulfide minerals, and Dowfroth® 250, the frother for improved metallurgy with reduced frother consumption, are two other well-known Dow mining chemicals. For a sample or information on any of these products write to THE DOW CHEMICAL COMPANY, TECHNICAL SERVICE AND DEVELOPMENT, Midland, Mich., Dept. SC926B.

*Trademark



New Disperser has been developed by Dow to permit dissolving of large amounts of Separan 2610 without use of a mechanical mixer. The solution needs no preservative in normal storage or use.

you can depend on DOW CHEMICALS DOW

FACING A TOUGH PROPOSITION?

you can beat it with *JALLOY*

Only a seasoned hunter with the right equipment can stand up to a charging rhino. And, likewise, only a special steel like JALLOY can withstand severe impact and abrasion . . . day after day. In comparison with mild steels as well as other abrasion-resistant steels, JALLOY gives outstanding results when heat-treated to your specifications.

This modern heat-treated plate brings savings in steel costs, maintenance, and repair, and also is easily welded. JALLOY is available in three grades, each of which is designed for specific applications.

J&L STEEL

Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Jalloy Plates outlast other steels by margins of 4 to 1

Jalloy lowers maintenance costs on ore and coal conveyors

Jalloy provides longer wear with less repair in truck bodies

Jalloy Aprons in Tyrock screen last 3 times as long as other steels

Jalloy heat-treated steel plate beats wear due to impact and abrasion

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 412, Pittsburgh 30, Pa.

☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

Name _____

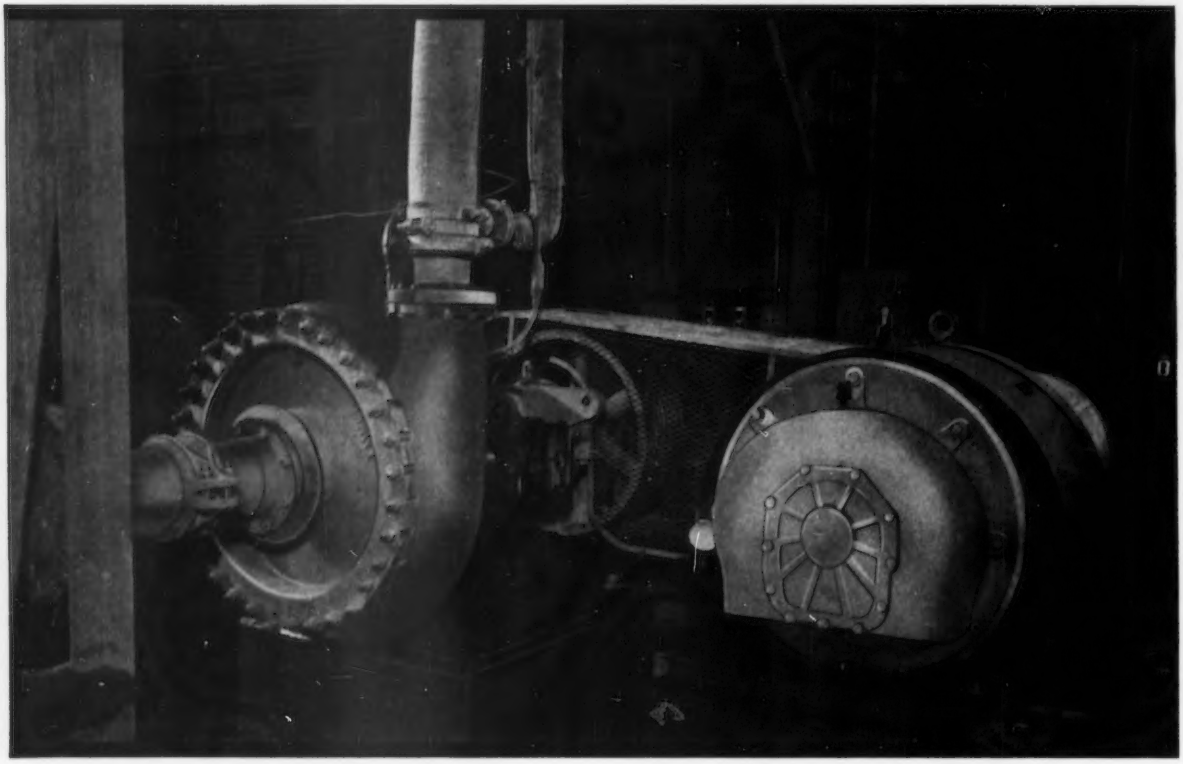
Title _____

Company _____

Address _____

City _____ Zone ____ State _____

Now...Amsco® Pumps built especially to handle abrasive mixtures



Wearing parts last longer because they're cast in HC-250 a special wear-resistant alloy

If you pump tailings, sand, taconite, cement mill slurry or any grinding, abrasive mixture . . . ordinary pumps don't stand a chance.

That's why Amsco now produces a type of pump with all wearing parts cast in an exceptionally abrasion-resistant metal. It's a special alloy called HC-250 . . . now used in Amsco Pumps where extremely abrasive applications are encountered. HC-250 has an abrasion resistance unsurpassed except by expensive carbide insert or hardfacing materials.

Whether your application calls for a pump to withstand extreme abrasion or severe impact, or a combination in-between . . . Amsco produces a line to meet your requirements. And, in addition to the special wear-resistant metals, Amsco pumps are compactly designed to save on labor costs when repairs are needed. Their simple design means fewer parts to wear out . . . fewer man-hours needed to disassemble and assemble an Amsco pump.

So, for trouble-free pump service, ask an Amsco pump specialist for a recommendation. He'll analyze your requirements and recommend the type of Amsco pump best suited for your application. Standard-size Amsco pumps range from 6″ to 16″ discharge openings. Larger sizes are also available. Write for Bulletin No. 548 IP which gives specifications and complete data on the Amsco pump line.

Amsco also manufactures a complete line of hardfacing welding equipment . . . both rods and machines.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

How to beat a fleet of limited-duty rigs

...WITH ONE

International® Drott 4-IN-1

Beat a power shovel wherever exclusive Drott *triple-power, pry-action break-out* is decisive—and where quick International crawler mobility can outspeed and "out-reach" a boom. Break-out force of the three Four-In-One models as Skid-Shovels ranges from 8,500 to 17,000 ibs!

Gain a 30-inch (or greater) dumping height advantage over ordinary roll-forward bucket dumping—by using the bottom-dump feature of the Four-In-One as a clamshell. And loading with the clamshell action, get a super-fast bucket-fill on stockpiled materials, even in cramped quarters.

Get versatile carry-type scraper action with the Four-In-One in Bullclam position. Using positive clam lip control, spread materials, strip, and grade with amazing accuracy. And as a Bullclam, the Four-In-One *heap-loads* itself with speedy, earth-boiling action!

Get big dozing capacity with finger-tip ease with your Four-In-One in bulldozer position. Regulate dozing depth by hydraulic "radius control" of blade pitch. Note the frost-breaking, earth-moving action. Shown here is new 2¼-yard Four-In-One for the International TD-14.

Prove Four-In-One versatility unlimited with the 1-yard TD-6, the 1½-yard TD-9, or the new 2¼-yard TD-14 model. Test *exclusive* pry-over-shoe break-out action, and *exclusive* shock-swallowing Hydro-Spring. Ask your International Drott distributor for a Four-In-One demonstration.

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL® DROTT

HOW MARCY EXPERIENCE

WITH 2-STAGE GRINDING

Increases tonnage at lower cost

Mine and Smelter has specialized in the design, manufacture and application of Marcy Mills since 1915. The extensive research and experience during this time has resulted in many refinements in the grinding process. One of the most significant developments is 2-stage grinding.

Experience has proved two successful ways of using Marcy Open End Rod Mills for 2-stage grinding...

1. By addition of a grinding stage

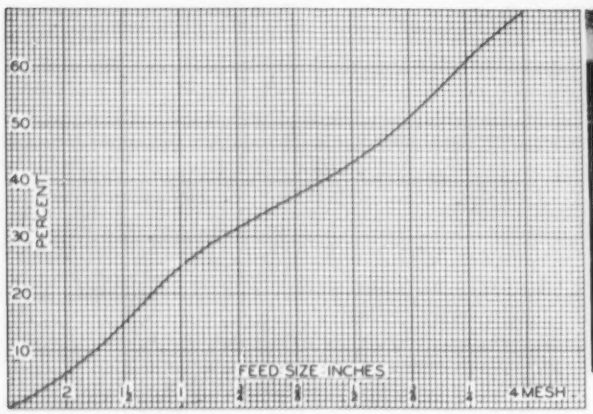
Adding Marcy Open End Rod Mills between existing crushing and grinding circuits...

- Permits larger size crusher discharge, thus greatly increases crushing capacity
- Rod mill can take 1" feed and produce a higher percentage of finished product than crusher
- Rod mill provides finer feed for ball mills, increasing their capacity
- Permits recovery of liberated mineral at coarser size

2. By replacing fine crushing

Replacing fine crushing with Marcy Open End Rod Mills gives all the advantages listed under No. 1, in addition to eliminating the high operating and maintenance costs of complex circuits of crushers, rolls, screens, elevators, etc.

Operating experience has proved that use of Marcy Open End Rod Mills for 2-stage grinding will increase tonnage at lower overall cost per ton



This graph shows increase in mill capacity with decrease in size of feed. For example if a rod mill was used to decrease ball mill feed from 1" to 4 mesh the ball mill capacity would be increased 45%.

This large copper company installed a 9½' x 12' Marcy Open End Rod Mill in parallel with its 2-stage roll-screen circuit. As a result of this test 17 Marcy Rod Mills were installed to replace all roll-screen circuits. Rod Mill feed is 1½" hard ore; grind is to 4% + 10 mesh; tonnage up to 2700 tons per day, each mill. They reduced costs and improved operating conditions.

The Mine & Smelter Supply Co.

DENVER • SALT LAKE CITY • EL PASO • NEW YORK

Representatives in Foreign Countries

FOR ACTUAL OPERATING DATA ON 2-STAGE GRINDING ← WRITE, WIRE OR CALL

YOUR WICKWIRE ROPE DISTRIBUTOR SUPPLIES THE ANSWERS TO WIRE ROPE PROBLEMS

One of the best ways to find out "what goes" is to be right on the spot. That's why a Wickwire distributor is a wire rope expert – he practically lives with the industries he supplies with wire rope. He knows his customers' specialized problems from first-hand experience, and is able to give competent practical advice on the best construction – 6x19, 6x37, 8x19, etc. – for them to use. And he delivers the type, size and length of wire rope they need directly from his warehouse stocks. They save time . . . storage space . . . paper work.

Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and wire rope slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

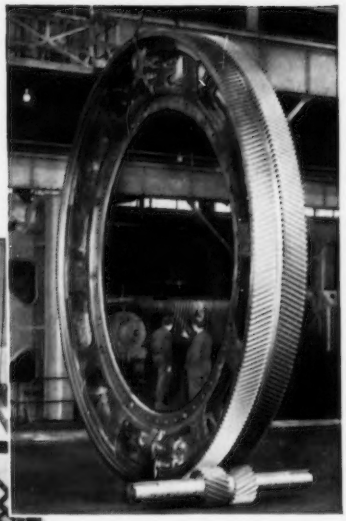
CF&I WICKWIRE ROPE A CF&I PRODUCT

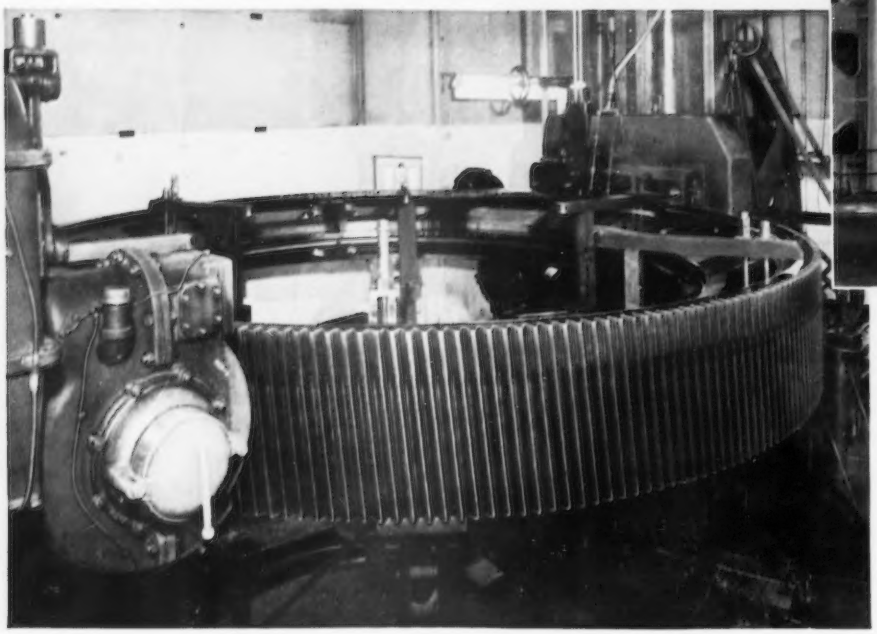
A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

3153

Gears by FALK

. . . a good name in industry





ABOVE: In foreground, split ring herringbone gear, 16¾ feet in diameter. In background, a single helical gear is being rough-cut on special hobbing machine (which also can cut herringbone or spur gears).

LEFT: Split ring gear receiving final cutting on special hobbing machine, designed and built by Falk. It is operated in a temperature-controlled room to minimize dimensional variations.

Here's how MODERN GEARS can SAVE MONEY for you...

• Are you making the mistake of driving your costly mills and kilns with gears of antiquated design—or with gears made to a price, rather than to the topmost standards your operation deserves?

Falk Helical Gears are the most efficient gears (98½%) you can buy. They can bring you these substantial savings:

1. They last longer, hence reduce your over-all gear investment.
2. Pinion replacement can be sharply reduced when gears are properly proportioned and installed, and adequate lubrication and enclosures are provided.
3. They give better performance and longer life to your driving and driven machinery.
4. Their higher possible ratios permit use of higher-speed motors—a saving in motor costs and in power bills.

As the country's largest supplier of precision gearing, Falk is the manufacturer best equipped to *recommend without prejudice* the exact gear most suited to your specific application. Whatever type gear your job demands—single helical, herringbone or spur—Falk has unsurpassed facilities to engineer and produce it.

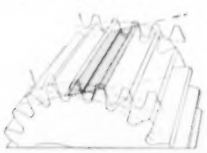
You are invited to contact any Falk representative—also, **write for Report 6170,** "Advantages of Helical Gearing"

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 8, WISCONSIN

GEAR FACTS FOR ENGINEERS

The greater capacity of Falk Helical Gears, whose teeth are cut obliquely across face, is shown by the sketches below. When helical gears mesh, two or more teeth are always in contact; they share the load. Result: maximum contact area, greater capacity and strength.

By contrast, on gears with teeth cut straight across the gear face (as in spur gears), there are alternately one or two teeth in contact when gears mesh. Result: Very small contact area. The load-carrying capacity (rating) is determined by minimum contact conditions when but one tooth sustains the load.



On the basis of comparative sizes of contact areas of the two gear types, the high capacity of helical gears over competing types is apparent. Engineers, operators and maintenance men who have experienced the advantages of Falk Helical Gears are unwilling to "settle for less".

Longyear

Wire line Core Barrel? Just ask the man on the rig floor!

Longyear's Wire Line Core Barrel lets driller concentrate on good drilling techniques

Wire Line Core Barrel Shows *Better Results . . . Lower Costs*

Drill Runners Report 95% Core Recovery—No Back-Breaking Effort! How? By eliminating the need for pulling the entire string of drill rods. Longyear's Wire Line Core Barrel is out-performing conventional equipment, giving more footage per shift with less effort. Result: LOW COST! A recent field report disclosed only *one round trip* for the drill rods to obtain a hundred feet of coring at ten foot intervals. Ten round trips would have been required with conventional equipment. Another company reporting on Wire Line Core Barrel performance at depths of more than 4000 feet reported *saving 50 shifts—faster progress—better core recovery.*

The drillers' objective, RECOVERY OF CORE, is no longer a backbreaking chore. Freed from the difficult, time-consuming chore of frequently hoisting the drill string, "THE DRILLER NOW HAS TIME TO CONCENTRATE ON GOOD DRILLING TECHNIQUES." In a 3000-foot hole, total elapsed time from start of pulling core to resumption of drilling was recorded at *less than 33 minutes!*

Write for the Wire Line story today . . . a story of INCREASED CORE RECOVERY WITH LESS EFFORT—MORE FOOTAGE PER SHIFT—LOWER DRILLING COSTS—LESS CHANCE OF CAVING—LONGER BIT LIFE. Actual case histories of the use of this revolutionary diamond drilling tool in the field will be included with our bulletin.

Write for Bulletin No. 201

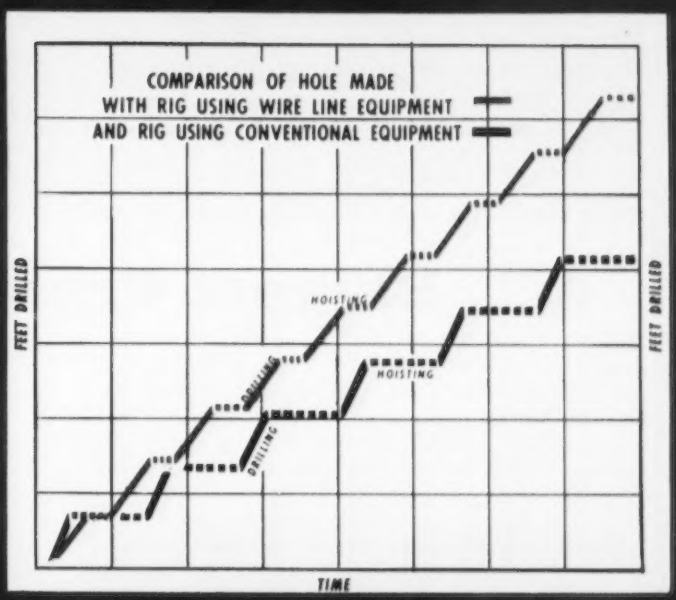


Chart shows advantages over conventional equipment which accrue in both SHALLOW and DEEP hole drilling

E. J. Longyear Co. MINNEAPOLIS, MINN. · CABLE LONGCO

CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO · LONGYEAR ET CIE., PARIS, FRANCE

Biggest Granite Quarry

Rock of Ages, at Barre, Vt., is the world's largest quarry for monumental granite. The opening covers an area of about 45 acres, and the quarry is so deep that, in parts, it could easily swallow a 27-story building. Geologists are of the opinion that the material extends into the earth for nearly 35 miles.

Rock of Ages granite is a dense, igneous type of rock, a premium material occurring not as strata but in the form of gigantic boulders which are irregular in shape. Throughout the quarry Bethlehem Hollow Drill Steel, 1¼ in. round and 1 in. hexagon, is used to release these boulders from the mass. Blasting, because of its shattering effect, is employed sparingly, and then only to remove rock which is not true memorial material.

Rock of Ages has a grain just like wood, and therefore must be cut either with the grain, or directly across it. Using Bethlehem Hollow, quarrymen drill a line of closely-spaced holes in one direction, then follow with holes at right angles to the original line. Steel wedges are then inserted in the holes, and pounded evenly until the piece cracks.

At Rock of Ages, as well as in scores of other applications, Bethlehem Hollow Drill Steel is providing dependable, low-cost-per-foot-of-hole performance. This fine drill steel, rolled from a tough, fatigue-resisting steel, has a wide quenching range, making it easy to heat-treat for the ideal balance of hardness and wear-resistance. It also makes long-wearing threads and tough shanks.

Bethlehem Hollow is made in rounds, hexagons and quarter-octagons, and is generally furnished in lengths of 18 to 25 ft. Longer lengths can also be supplied. It's the ideal drill steel for your next rock-removal project.

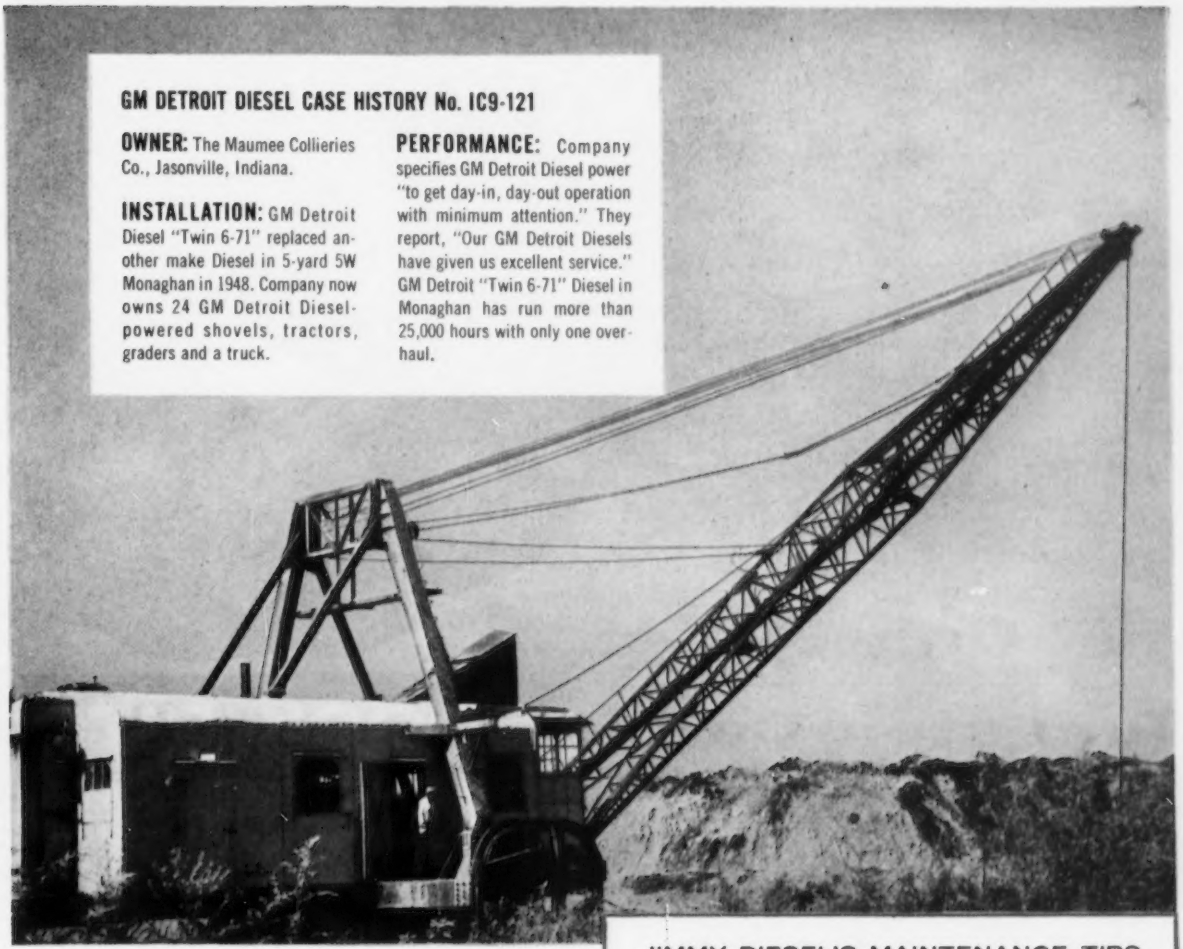
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL CARBON AND ULTRA-ALLOY

BETHLEHEM STEEL

"ON THE JOB DAY-IN AND DAY-OUT"



GM DETROIT DIESEL CASE HISTORY No. IC9-121

OWNER: The Maumee Collieries Co., Jasonville, Indiana.

INSTALLATION: GM Detroit Diesel "Twin 6-71" replaced another make Diesel in 5-yard 5W Monaghan in 1948. Company now owns 24 GM Detroit Diesel-powered shovels, tractors, graders and a truck.

PERFORMANCE: Company specifies GM Detroit Diesel power "to get day-in, day-out operation with minimum attention." They report, "Our GM Detroit Diesels have given us excellent service." GM Detroit "Twin 6-71" Diesel in Monaghan has run more than 25,000 hours with only one overhaul.

THE STORY of the Maumee Collieries is duplicated thousands of times.

A customer gets his first General Motors Detroit Diesel. And it quickly establishes a fast-working, cost-cutting reputation.

Then he buys another—and another—until soon he's standardized on GM Detroit Diesel power.

For a GM Detroit Diesel is packed with real snap that makes the job go faster—sets the pace for your whole operation. And after you see what this Diesel can do, you'll be satisfied with no other Diesel.

The reasons are simple. Two-cycle operation. Easy maintenance. Simple repairs. Low-cost, interchangeable parts and fast service everywhere.

These are just a few reasons why it's *America's first choice Diesel.* Your local GM Detroit Diesel distributor can tell you the full story or write direct.

JIMMY DIESEL'S MAINTENANCE TIPS

Got Spring Fever? Maybe your engines have, too. Your GM Detroit Diesel distributor or dealer can snap 'em out of it with a spring tune-up. And he'll help you set up a preventive maintenance program to keep your engines running right all summer long. Take care of your engines and they'll take care of you and remember—Preventive Maintenance Doesn't Cost—It Pays.

Jimmy Diesel

DETROIT DIESEL

Engine Division
of General Motors
Detroit 28, Michigan

Single Engines . . . 30 to 300 H.P. Multiple Units . . . Up to 895 H.P.

America's Largest Builder of Diesel Engines

OFFSET WING DESIGN
DEEP SLOTTED CHIP-WAYS
PRECISION MILLED THREADS
CONCENTRIC PRECISION MILLED SEATING SURFACE
IMPROVED BRAZING TECHNIQUE
MACHINED FROM SPECIAL ALLOY STEEL
CHOICE OF TWO GRADES OF TUNGSTEN CARBIDE

Only JOY

Tungsten Carbide ROCK BITS

offer all these features

The results of improved manufacturing techniques

OFFSET DESIGN OF WINGS for drag-free rotation, faster removal of cuttings to permit faster drilling, easy and inexpensive reconditioning.

DEEP SLOTTED CHIP-WAYS allow cuttings to escape readily; the bit does not regrind its own cuttings.

IMPROVED TECHNIQUE FOR BRAZING INSERTS to prevent loss of inserts and to assure maximum drill footage and minimum loss of gauge.

MACHINED FROM SPECIAL ALLOY STEEL and heat treated by an exclusive process to provide high fatigue life and maximum shock resistance. This feature makes the Joy Tungsten Carbide Bit *best for any rock formation.*

CHOICE OF TWO GRADES OF TUNGSTEN CARBIDE—a hard grade for abrasive formations and a medium grade for harder formations.

PRECISION MILLED THREADS insure dimensional uniformity, positive rotation and uniform thread tolerances.

CONCENTRIC PRECISION MILLED SEATING SURFACE permits full contact of bit threads and rod threads. The bit seats firmly against the drill rod upset, radial play is prevented and life of threads and rods is lengthened.

Joy Tungsten Carbide Rock Bits are available in the following gauge sizes:

CROSS TYPE, JHO—1½", 1⅝", 1¾", 1⅞", 2"
CROSS TYPE, JDO—1⅞", 2", 2⅛", 2¼", 2⅜", 2½", 2¾", 3"
X TYPE, JX—3½", 4", 4½"

Write for FREE Bulletin 70-4

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS AND BLOWERS

WSW M6012-70

JOY

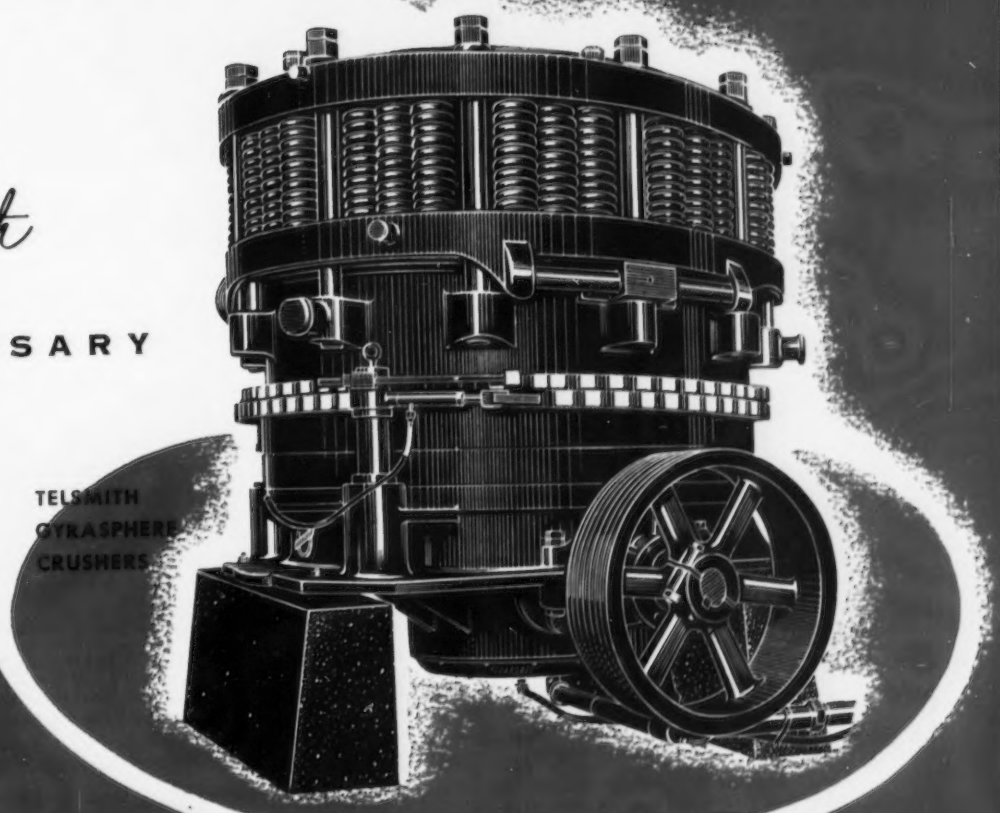
WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

1906

TELSMITH

MINING EQUIPMENT

50th ANNIVERSARY



TELSMITH GYRASPHERE CRUSHERS

1956

SEND FOR CATALOG 266

SMITH ENGINEERING WORKS

502 E. CAPITOL DRIVE — MILWAUKEE 1, WISCONSIN

Representatives in Principal Cities in All Parts of the World • Cable Address: Smgworks, Milwaukee

This Allis-Chalmers Crawler Tractor
MAKES A TIDY PROFIT
THEN LEAVES A TIDY LANDSCAPE

The marked trend toward land reclamation is placing more and more importance on the crawler tractor. For only the crawler tractor is flexible enough to pay its way through all stages of open pit operation.

Here, the Allis-Chalmers HD-16 proves to be a real efficiency expert as it demonstrates its usefulness both during *and after* an area has been worked.

Before production begins, the HD-16 strips and stockpiles overburden. If distance from pit to stockpile is too great for dozer operation, this versatile crawler teams up with a pull-type scraper for this initial job.

After the area has been worked out, the reclamation job begins. Overburden and waste, which have been stockpiled by the busy dozer, are now pushed into the pit and leveled off quickly. Reclaimed area can then be seeded for pasture, subdivided, or developed into some other form of usable land.

During mining operations, the HD-16 is always busy. It builds and maintains haul roads, feeds hoppers and conveyors, maintains stockpiles, skids heavy equipment, handles drainage problems, is ready and able wherever a push or pull is needed.

ALLIS-CHALMERS HD-16

your choice of two outstanding drives

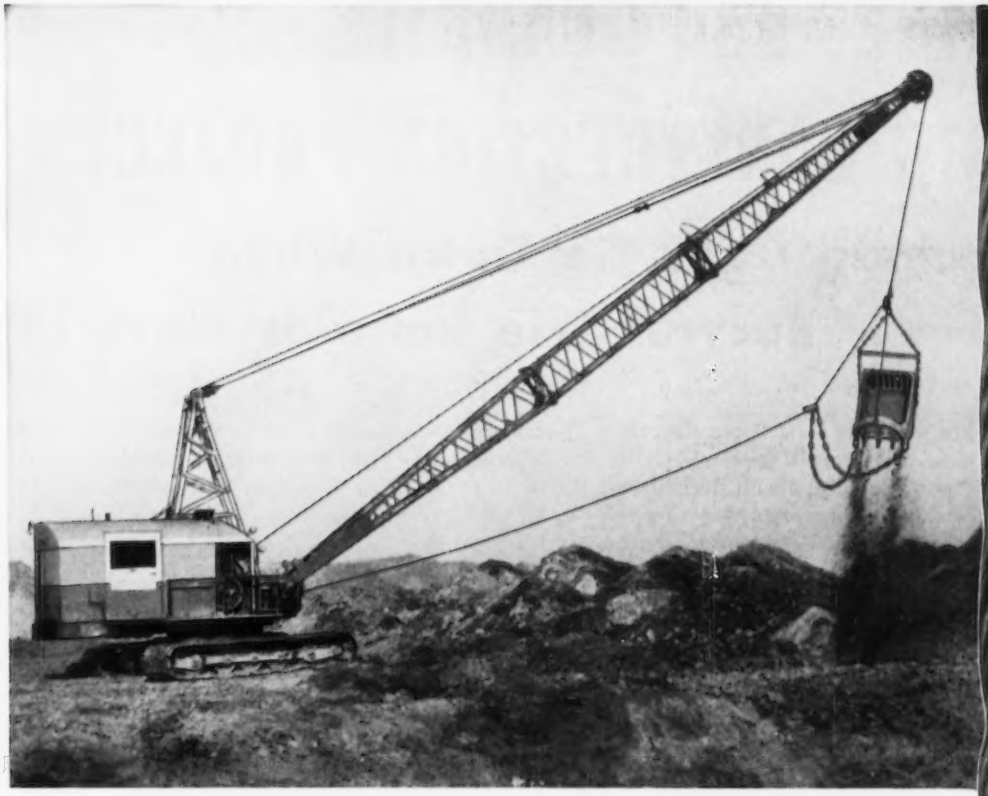
	Horsepower	Weight
Torque Converter Drive	150 net engine	31,600 lb
Standard Transmission Drive	131 belt	31,500 lb

plus new, longer truck frames, long-life track, straddle-mounted final drive, easier servicing . . . many other outstanding features.

CONSTRUCTION MACHINERY DIVISION,
MILWAUKEE 1, WISCONSIN

Write for literature or get the full story from your Allis-Chalmers dealer.

ALLIS-CHALMERS



New VHS Dragline Lasts 58% Longer ...at Keller Mines

• Mr. John Oreskovich, Superintendent of Keller Mines, Inc., Beloit, Ohio says: "9 to 12 days used to be about all the life we could expect from the best Improved Plow Steel draglines on this Lima 1201 excavator. However with new VHS we are getting from 19 to 24 days—increasing service life from 58% to over 100%. Naturally we have switched to VHS on every piece of equipment for which a VHS line is made."

Service records like this are becoming commonplace in the mining industry. For new tougher VHS resists abrasion . . . keeps its shape under pressure . . . can't become "hide bound" or lose its flexibility. Developed specifically for draglines, slusher ropes and shovel hoist ropes, it stands up better in these toughest of wire rope applications.

Cuts "Down Time," Saves Money—The longer life you get from new VHS saves you money. And you make additional savings by cutting costly "down time" of equipment for wire rope replacement.

Stronger Too—New VHS, made from a new grade of steel for wire rope, is at least 15% stronger than Improved Plow Steel—the strongest grade available before the introduction of VHS. This means you can handle heavier loads with the same diameter line. And you have a higher factor of safety . . . additional insurance against sudden overstresses.

Easy to Order—You don't need any complicated specifications to order new VHS. Just call your Hazard distributor and ask him for a VHS dragline, shovel hoist rope or slusher rope in the size you want. He has it in stock.

For more information see your Hazard distributor salesman or write to the nearest Hazard office for Bulletin DH-513H

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

LAY-SET VHS

15% Stronger • Tougher • More Wear-Resistant

IN MINES and QUARRIES...

ON BIG CONSTRUCTION PROJECTS

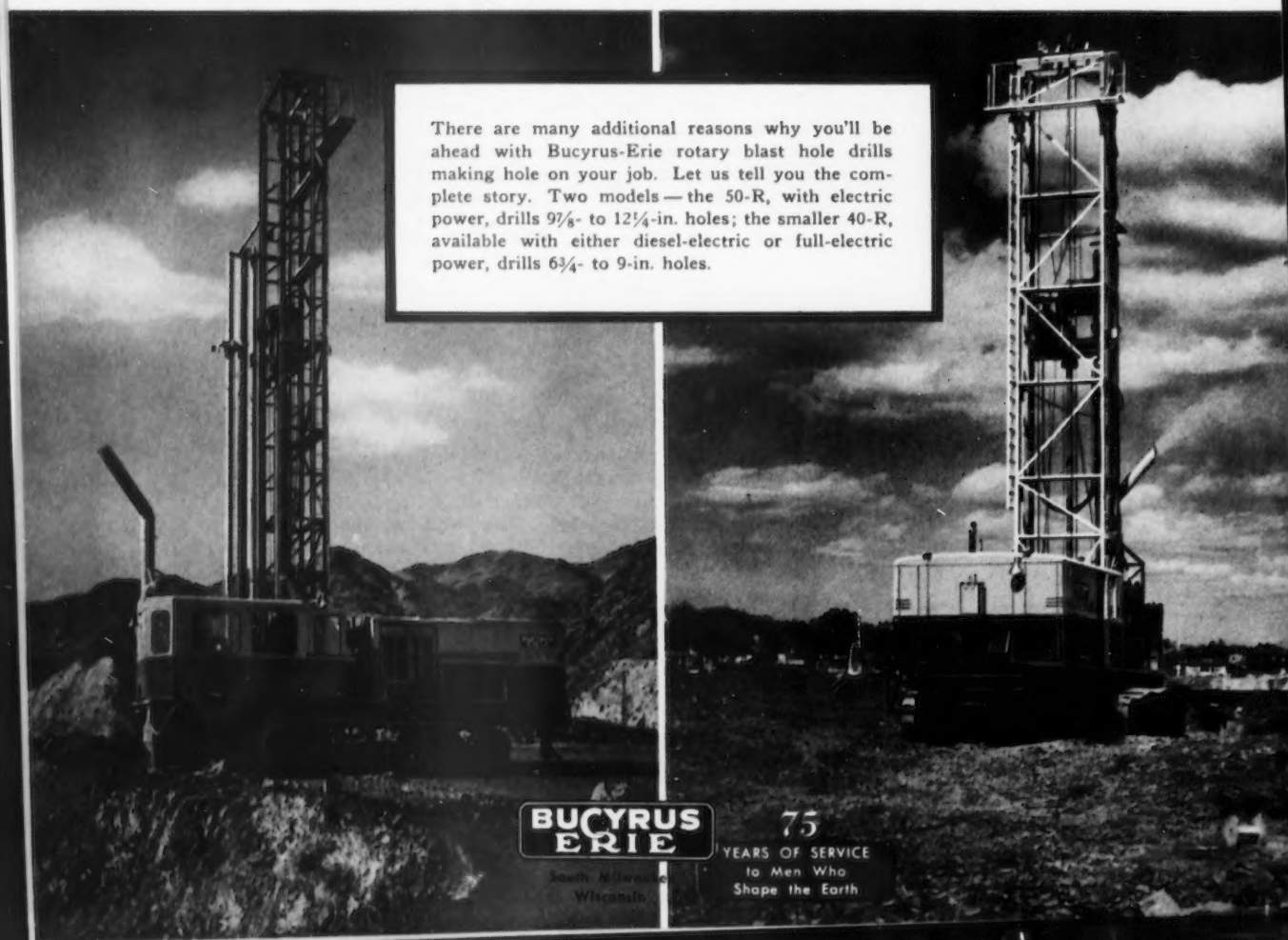
Preparation Costs Go Down When Bucyrus-Erie Rotaries Move In

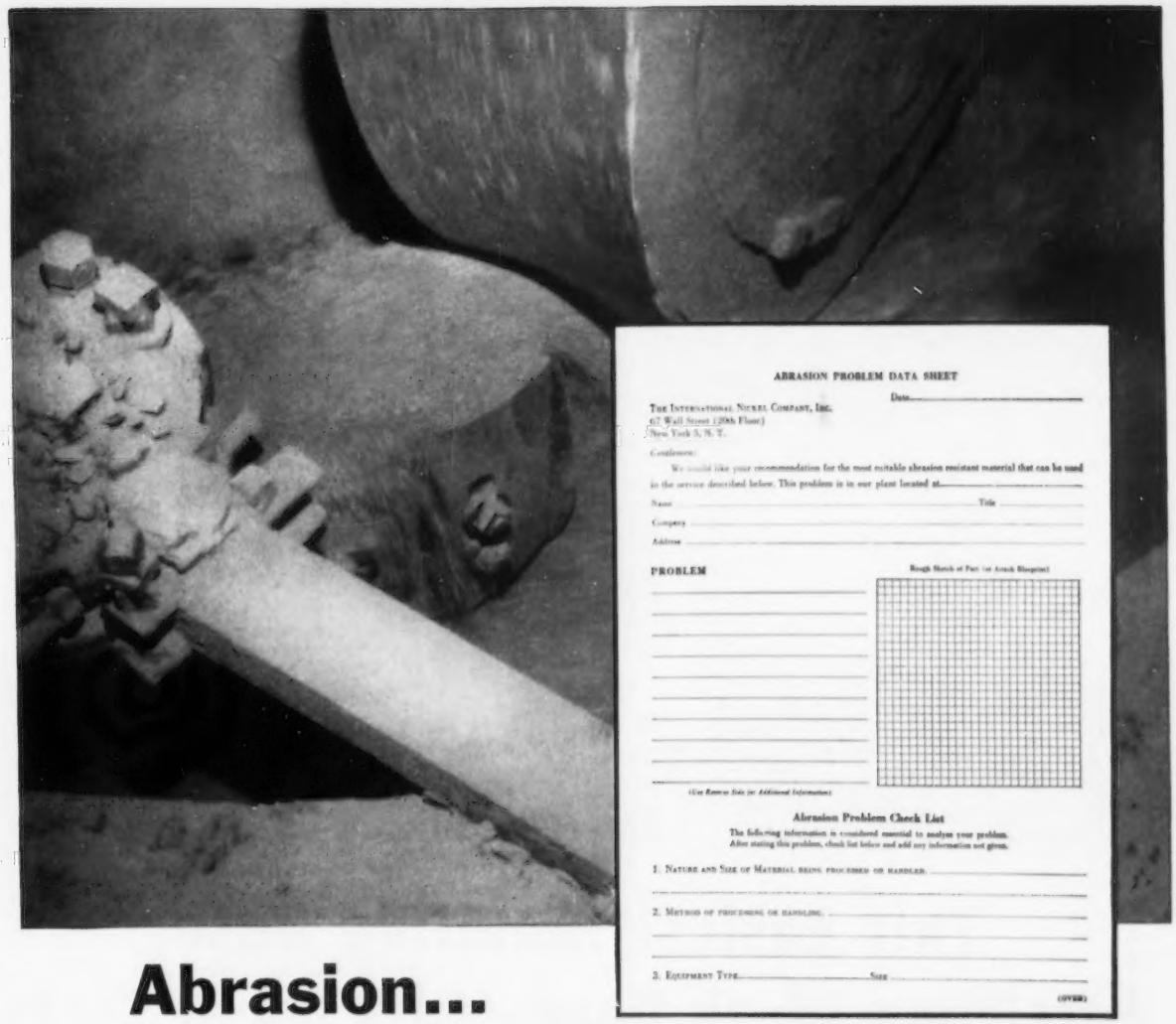
Wherever big diameter blast holes are called for, Bucyrus-Erie rotary drills are top choice. Drilling in many types of difficult formations, they have repeatedly demonstrated they can prepare material economically. Production figures in mines and quarries and on big construction jobs show a sharp reduction both in direct drilling cost and in cost per ton of material broken when Bucyrus-Erie rotaries go to work.

You're ahead on cost per lineal foot of hole because these rotaries drill large diameter holes faster than other machines drill small diameter holes. Operating control is completely flexible for producing the right combination of rotating speed and pulldown pressure that is most effective in the formation encountered.

You're ahead on cost per ton broken because large-diameter rotary drilled holes permit economical blasting procedures. The big-hole drilling technique requires fewer holes to bring down a given volume of rock or ore. It produces excellent fragmentation without increasing the quantity of explosive, and reduces the need for secondary blasting.

32856C


There are many additional reasons why you'll be ahead with Bucyrus-Erie rotary blast hole drills making hole on your job. Let us tell you the complete story. Two models — the 50-R, with electric power, drills 9⅞- to 12¼-in. holes; the smaller 40-R, available with either diesel-electric or full-electric power, drills 6¾- to 9-in. holes.
BUCYRUS ERIE
South Milwaukee Wisconsin
75 YEARS OF SERVICE to Men Who Shape the Earth



ABRASION PROBLEM DATA SHEET

Date

The International Nickel Company, Inc.
67 Wall Street (20th Floor)
New York 5, N. Y.

Gentlemen:

We would like your recommendation for the most suitable abrasion resistant material that can be used in the service described below. This problem is in our plant located at

Name Title

Company

Address

PROBLEM

Rough Sketch of Part (or Attach Blueprint)

(Use Reverse Side for Additional Information)

Abrasion Problem Check List

The following information is considered essential to analyze your problem. After stating this problem, check list below and add any information not given.

1. Nature and Size of Material being processed or handled.

2. Method of processing or handling.

3. Equipment Type Size

(OVER)

Abrasion... and a suggestion for its control

Scores of Plant Operators have cut abrasive wear to a degree sometimes thought unattainable, but finally demonstrated by their own equipment.

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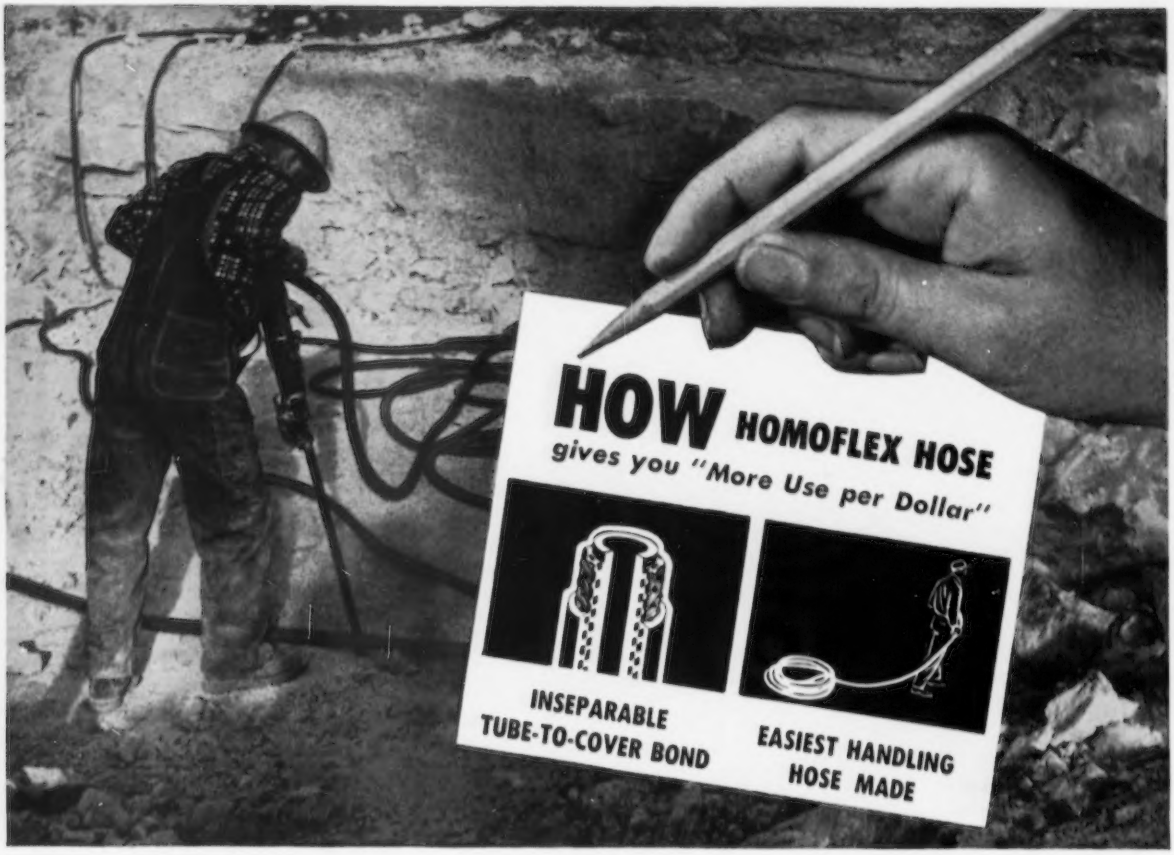

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Location — The Dalles, Oregon.

Project — The Dalles Dam — Excavation of South Fishway.

Rock — lava basalt 91,000 cubic yards.

Report — Eimco's 105 Tractor Excavator was purchased for this job after several other types of equipment had been tried and proved either entirely unsatisfactory or incapable of maintaining the desired pace. The fishway (shown above) was excavated in lava basalt (typical of this section) with its characteristic flows and faults. Blasting in the faulted zone left many large blocky pieces of rock.

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B-178

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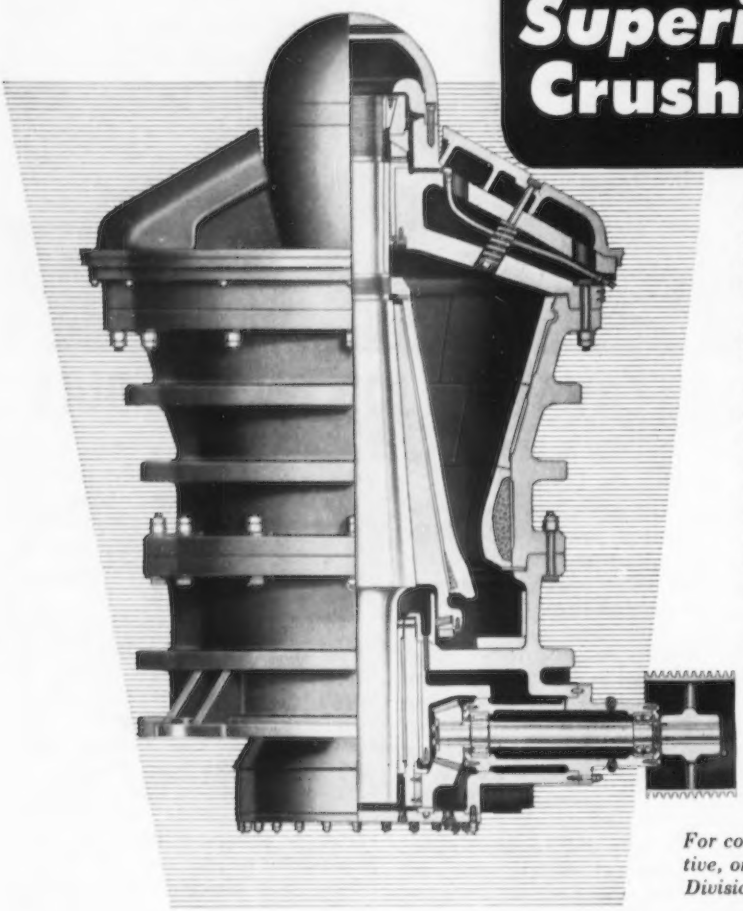

• With a *Superior* gyratory crusher pacing production, your entire circuit remains in balance. Subsequent equipment—crushers, screens, grinding mills—need not be readjusted to varied product sizes and capacities. The many variable factors provided by the *Superior* crusher permit obtaining the kind of production flow demanded by your other equipment. For example, changing eccentric throws, crusher speed or shape of crushing chamber varies capacity and product size. The *bottom discharge* permits utilizing the concrete foundation as a surge bin to control flow of material through your plant.

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For complete information, see your A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis., for Bulletin 07B7870.

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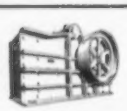
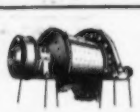


Jaw Crushers

Gyratory Crushers



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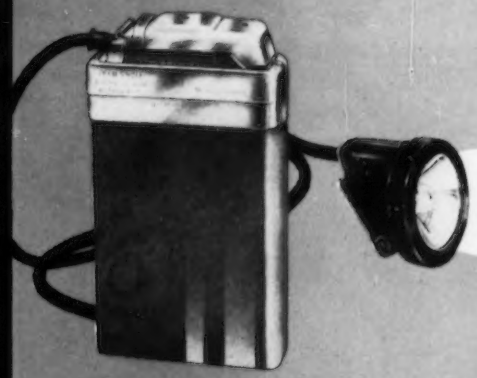

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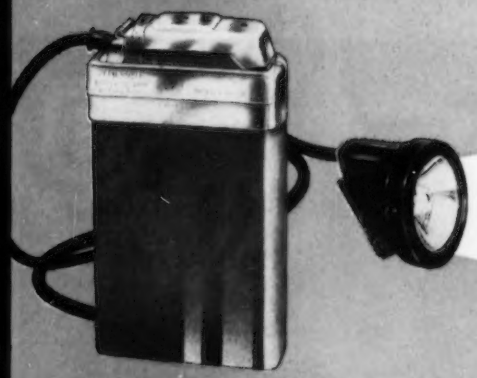
See the double filament in the bulb? It's your proved protection against lost time for the miner, and a short crew for the foreman. If one filament burns out, a turn of the switch restores continued, brilliant, full illumination—*working light*, not just emergency light!



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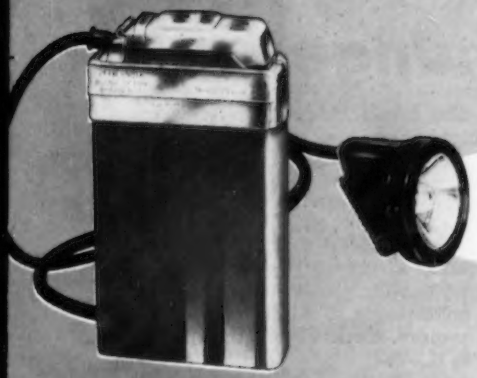

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ENGINEERING AND MINING JOURNAL

MARCH 1956

For a Strong Domestic Mining Industry . . . *A New Approach*

IT IS A FACT that mines cannot be started up or shut down like assembly lines in a factory and wild swings in prices and demands for metals since World War II have created undeniable havoc for many domestic producers. Real damage has been inflicted upon the little fellow who cannot afford huge outlays for labor-saving equipment, but must pay constantly rising wage rates. Not being able to beat labor costs down when prices drop, he simply has to go out of business. Since the marginal segment of domestic production is vital to national security and to the consumer, we ask ourselves "What can be done about it?"

Countless hours of discussion and debate have been spent on this problem by numerous spokesmen for the domestic mining industry during the past decades, but results achieved have been somewhat less than satisfactory. Perhaps we might try a slightly different approach.

One new and refreshing approach is indicated in a recent address before the Colorado Mining Association by Andrew Fletcher, president of St. Joseph Lead Co. A full report of the talk starts on p 75.

While no attempt will be made here to outline Mr. Fletcher's proposals in behalf of a strong domestic mining industry, we would like to underscore the logic of his proposals, since therein may lie the chances for success.

First we must determine who is likely to be affected by any proposed program. Mr. Fletcher stresses that a healthy mining industry will benefit the nation, the consumer, as well as the producer. If this point is proved, we are assured of a sympathetic and receptive political and public audience. This is a good step in the direction of success.

Next, we must establish some standard of judging the merits of any proposed remedy. Note the article's four-point yardstick emphasizing that a proposal will not be successful unless it is effective, fair, automatic and feasible.

Now we must face up to all major indisputable facts that will have a bearing on our deliberations, regardless of how unpalatable they may be. Note the "Four points to guide our reasoning"—particularly acceptance of the fact that neither Republican nor Democratic political administration is likely to favor high tariff protectionism in the future.

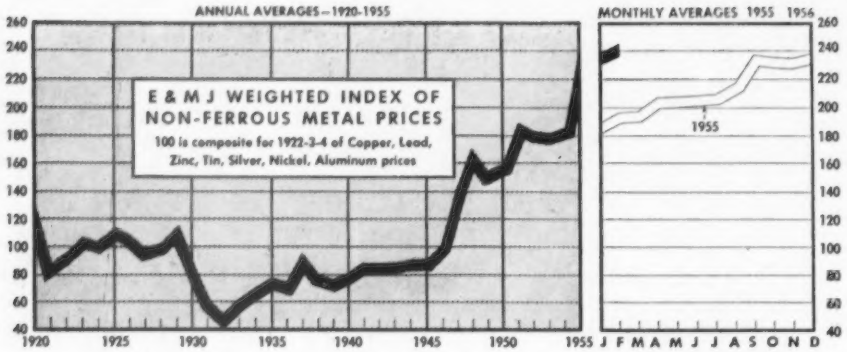
Finally, we must set down clearly all methods which might be effective in establishing a healthy domestic mining industry, and test these methods by the four-point yardstick. Mr. Fletcher tests four possible solutions. Read the answer on p 79.

Somewhere in the course of our logic, we must put the finger on the precise cause of our dilemma and prove it. Mr. Fletcher shows how sporadic dumping of foreign metals in the domestic market harms the high-cost producer, and equally sporadic withholding of metals by foreign producers puts the squeeze on the consumer. He documents his analysis with four case histories.

While we are not prepared to say whether Mr. Fletcher's proposal represents the best one for a healthy domestic mining industry, we do submit that any better proposal should be able to stand the same acid test that Mr. Fletcher applies to his.

E&MJ OUTLOOK

PRICES



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MARKETS

***E&MJ's* price index** moved upwards again in February. The new index is 241.49% of the 1922-24 average, about 2 points above January. Continued inflation of copper prices is responsible. Talk of price weakening has diminished; prices will probably hold until summer when other inflationary forces may come into play.

Lead prices in London are high enough to divert lead that ordinarily comes to the U. S. But the price here is not expected to be raised. Most sellers believe London often does not reflect the real market.

●

AT HOME

Helping or hurting? Competition for attractive mining prospects looms for present metal and non-metallics producers. Several large oil companies are eager to get in the field and will back up exploration and mining activities with substantial research programs. On the other hand, oil money in metals usage research could help a great deal.

Fireworks have started over the Feb. 20 Court of Claims decision that the Government is liable for damages caused by closing the gold mines in World War II. Three California firms are preparing to back up their claims; Homestake is asking $10-million for loss of profits and damage; Idaho Maryland, is asking $5-million plus; Central Eureka Corp., $1,265,000. Justice Department will probably appeal.

To boost alumina production from 1,000 to over 1,500 tons per day at the La Quinta plant (Corpus Christi), Reynolds Metals is ready to spend $25- to $30-million. Increase is needed for new 100,000-ton reduction plant to be built near Reynolds' Alabama operations.

Barlu Oil Corp.'s option to buy the Happy Jack uranium mine has expired. Barlu had transferred option to National Mining & Milling Co. whose officials feel that ore reserves would not "cover" the ultimate $30-million purchase price. Happy Jack owners, who have turned down offers of from $10- to $12-million, are now negotiating with New Shatex Corp., a company listed by AEC as having submitted proposals for a uranium mill near Medicine Hat, Utah.

●

ABROAD

The Soviets have steadily increased metal output. Tonnage figures for the year 1953, compared with 1938 stack up as follows: aluminum in 1953, 280,000 tons, in 1938, 50,000; lead, 185,000 and 69,000; refined copper 390,000 and 116,000; zinc 210,000 and 75,000. Russians are also said to be underbidding Western firms on industrial goods sales to underdeveloped countries, often "dumping" material to gain their ends.

In Italy, the House of Deputies is proposing to spend $15- to $20-million to rehabilitate the sulphur industry.

In Brazil, the national steel and iron works at Volta Radonda has just shipped the first pig iron over to the U. S. It's part of a million dollar order.

In West Germany, Alfried Krupp says he's ready to help develop ilmenite deposits on Ceylon's east coast.

U. S. Copper Producers Raise to 46c Other Major Producers Also Raise

ECONOMIC ACTIVITY in February continued at a high level. Speculation last month and earlier was that a reversal was setting in but present indications are that we have reached a plateau. Many people examining economic data feel too much importance was attached to the cutback in automobile assemblies. The Federal Reserve Board's seasonally adjusted index of industrial production for January was 144% of the 1947-49 average. We estimate the index at the same level for February. Most industries have continued at a high rate and probably have offset the decline in auto assemblies and the manufacture of auto parts. However, the index may be down one point.

Non-ferrous metal prices in February rose to 241.49% of the 1922-24 average, up 2.04 points from January, according to the *E&MJ* index of non-ferrous metal prices. The rise is a result of higher copper prices though zinc and silver also were up slightly. These rises more than offset the approximate four cent drop in tin and the slight drop in lead.

Copper prices charged by regular sellers of copper in the U. S. continued to rise throughout the month. There had been considerable talk about the possibility of copper prices falling to "reasonable" levels, reasonable in this case meaning some significant relation to costs. This talk has diminished—by the end of February few indicated they expected a drop before the summer. And during the summer they expect certain inflationary factors to become manifest.

In response to the tight copper market, sales were made at as high as 53.4¢ delivered in the U. S. Statistics showing January stocks (376,753 tons) held by U. S. fabricators were down about 13,200 tons from the end of December figure. The December figure was probably too high owing to heavy stocking for Lifo purposes. The January figure is back to about the November level. Shipments to consumers were 138,711 tons. Unfilled sales to consumers and unfilled purchases of copper from suppliers were up also. All of these suggest the easing, about which many had talked, was not yet here. Copper Institute figures for January show a drop in refined output in the U. S. of almost 22,000 tons; the strike at Laurel Hill was in part responsible for this. There may also have been a scarcity of materials for refining. Copper Institute data follow:

United States

	1955 Dec.	1956 Jan.
Production:		
Crude, primary	93,186(a)	96,962
Crude, secondary	10,911	11,074
Totals	104,975	108,036
Refined copper	145,423	123,798
Deliveries, refined	138,803	130,542
Stock at end, ref'd	61,554	50,016

Outside United States

Production:		
Crude, primary	120,659	137,010
Crude, secondary	801	897
Totals	121,460	137,907
Refined copper	104,926(a)	113,502
Deliveries, refined	108,565(a)	111,883
Stock at end, ref'd	159,777(a)	167,299

(a) Corrected figures.

The Laurel Hill refinery strike of Phelps Dodge was ended February 13; it began January 10. About 13,000 tons would have been lost or postponed but some materials were sent to other refineries. Kennecott's Nevada Mines division was on strike for about four days near the middle of February.

Chilean Minister of Economy Herrera said the January 23 wage and cost freezing law will be strongly enforced and that other economic control measures would follow. But he also said a single free exchange rate would be permitted in place of the present multiple controlled rates, suggesting that economic controls in some cases may be dropped.

Anaconda announced on February 15 it planned to erect new facilities and develop new orebodies in Chile.

Producers in the U. S. raised the price of their copper to 46¢ a lb delivered. On Friday, February 17, Anaconda announced its price for copper would be 46¢ at the close of business that day. Beginning with business February 21 all U. S. sellers were at the new or higher price except for intracompany pricings by firms not selling on the market. There had been some thought in the trade that prices might be raised—there had been reports of Chilean pressure for higher prices and when Anaconda indicated plans for new investments in Chile and a government spokesman said free exchange rates would be permitted the possibility became apparent. Many sellers did not like the price rise and many fabricators felt more strongly about it.

By February 21 nearly all fabricated products were based on the 46¢ price. Fabricators were compelled to pass the price increase along to consumers. Custom smelter price policy remained unchanged. At least one foreign producer made deliveries as late as February 24 on the 43¢ basis.

Rhodesian Selection Trust group of companies raised their price effective February 27, to £385 per long ton, c.i.f. U. K., for U. K. customers. At the present exchange rate of about $2.80825, this is about 48¼¢ a lb. Other important producers outside the U. S. raised prices, though in at least one case by less than 3¢. Many observers say the new RST price is not a departure from the firms' policy in support of price stability or of their belief copper is priced too high. Some of the firms' costs, they say, change according as copper prices of other sellers change, limiting the extent to which raises may be resisted.

London copper prices moved about during the month. They rose enough, after the price increased to 46¢ in the U. S., to maintain the differential almost unchanged. Many factors in the copper market believe any general increases here merely push up the London price. London reached £425 cash bid, about 53¼¢ a lb. If a cent or more is added to this, the premium in order to get specifiable copper, the London price was above 54¢.

Lead remained at 16¢ New York all month. It had dropped back from 16½¢ January 13. London moved from a low of about £111 January 17 to £124½ in the last week of February, about 15.6¢. At this price much lead from non-U. S. sources which ordinarily comes here could be more profitably sent to Europe. But U. S. sellers will hesitate to raise the price largely because they feel the London price movements are generally not indicative of real market situations.

Lead sales eased a little in February but sellers did not worry about this. The statistical position is good and GSA came in for offers so they do not expect a price change.

Zinc prices remained steady throughout the month and there was no expectation of a change. A few users have asked their deliveries be postponed for a month or two. In most cases these are users of Special High Grade who make automobile parts. They suggest there will be a pick-up of seasonal buying and production in the spring and summer. GSA asked for offers.

American Zinc Institute data for 1955 and January 1956 follow:

	1955	Dec.	Jan.
Stock at beginning	124,277	38,058	40,979
Output	1,031,012	92,578	90,313
Output, d.a.	2,825	2,986	2,913
Shipments:			
Domestic	1,007,619	87,010	87,723
Export & drawback	19,496	684	1,084
Government	87,200	1,963	1,155
Totals	1,114,316	89,657	89,962
Stock at end	40,979	40,979	41,330
Unfilled orders	72,908	72,908	(a)60,717

(a) Corrected

Primary aluminum prices have not changed though secondary prices have come down slightly. They are still 4 or 5¢ above the equivalent primary product. Secondary producers may be able to get more scrap that formerly was going back to primary producers. The market is still very tight. Alcoa is reported looking for a location for a 150,000-ton reduction plant. Reynolds is expanding its alumina facilities to supply its planned expansion of primary in northern Alabama.

Quicksilver prices continue to decline. The last week of February they dropped to $264 per flask. Some buyers said this is still a very high price. An increasing supply has been coming on the market. Most factors expect this to continue and say the price will go lower.

MARKETS *(Continued)*

Average Prices February (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	44.588
Electrolytic, export, refinery	45.822
Lead:	
Common, New York	16.000
Common, St, Louis	15.800
Silver and sterling exchange:	
Silver, New York, per oz.	90.901
Silver, London, pence per oz.	78.565
Sterling Exchange, "Checks"	280.645
Zinc:	
Prime Western, East St. Louis	13.500
Prime, Western, delivered (g)	14.000
Tin:	
New York Straits	100.745
New York, 99% min. (e)	99.745
Gold, per oz. U. S. price	$35.000
Quicksilver, per flask	$267.583
Antimony *(E&MJ)* (d)	36.470
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$103.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	24.400
Magnesium, ingot	32.500
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

Volume declined 18% in February. Coin prices continued to rise. Asiatic centers showed increased activity; South American markets were active. African trading increased, due to political unrest. European dealings were lively but no Soviet gold sales were reported. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 dg)	
	Jan. 31	Feb. 29	Jan. 31	Feb. 29
NEW YORK, transit	.....	.....	$35.08	$35.15
MANILA	$40.50	$40.75	36.25	36.25
HONG KONG	41.00	43.40	37.88	38.00
BOMBAY	52.50	53.50	51.25	53.00
TANGIER	41.60	41.50	34.95	34.94
BEYROUTH	42.05	43.25	35.12	35.13
PARIS	42.50	42.00	35.95	35.95
BUENOS AIRES	38.25	38.50	35.55	36.00

Note: Prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Feb. 1956	Electrolytic Copper (a) Domestic	(b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
1	43.325	45.050	16.000	15.800	14.000	13.500	22.500	101.000
2	44.350	44.975	16.000	15.800	14.000	13.500	22.500	98.750
3	44.050	44.600	16.000	15.800	14.000	13.500	22.500	98.500
4	No Market	44.600	16.000	15.800	14.000	13.500	22.500	98.500
6	43.900	45.575	16.000	15.800	14.000	13.500	22.500	99.000
7	45.325	44.250	16.000	15.800	14.000	13.500	22.500	99.500
8	44.575	43.775	16.000	15.800	14.000	13.500	22.500	99.625
9	43.500	45.100	16.000	15.800	14.000	13.500	22.500	98.625
10	42.875	44.975	16.000	15.800	14.000	13.500	22.500	99.000
11	No Market	44.975	16.000	15.800	14.000	13.500	22.500	99.000
13	42.700	44.850	16.000	15.800	14.000	13.500	22.500	Holiday
14	43.300	45.525	16.000	15.800	14.000	13.500	22.500	100.375
15	42.700	45.275	16.000	15.800	14.000	13.500	22.500	100.250
16	44.725	44.375	16.000	15.800	14.000	13.500	22.500	99.750
17	44.600	45.650	16.000	15.800	14.000	13.500	22.500	100.125
18	No Market	46.200	16.000	15.800	14.000	13.500	22.500	100.125
20	45.075	45.700	16.000	15.800	14.000	13.500	22.500	100.750
21	45.700	46.175	16.000	15.800	14.000	13.500	22.500	100.750
22	Holiday	46.900	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
23	46.675	46.300	16.000	15.800	14.000	13.500	22.500	102.250
24	46.175	48.725	16.000	15.800	14.000	13.500	22.500	105.750
25	No Market	48.725	16.000	15.800	14.000	13.500	22.500	105.750
27	46.150	46.700	16.000	15.800	14.000	13.500	22.500	105.750
28	46.175	47.875	16.000	15.800	14.000	13.500	22.500	102.500
29	45.875	48.700	16.000	15.800	14.000	13.500	22.500	101.500
AVERAGES FOR MONTH								
Feb.	44.588	45.822	16.000	15.800	14.000	13.500	22.500	100.745
AVERAGES FOR WEEK								
Feb.								
1	43.580	45.788	16.000	15.800	14.000	13.500	22.500	101.792
8	44.440	44.629	16.000	15.800	14.000	13.500	22.500	98.979
15	43.015	45.117	16.000	15.800	14.000	13.500	22.500	99.450
22	45.025	45.833	16.000	15.800	14.000	13.500	22.500	100.300
29	46.210	47.838	16.000	15.800	14.000	13.500	22.500	103.917
CALENDAR WEEK AVERAGES								
Feb.								
4	43.695	45.283	16.000	15.800	14.000	13.500	22.500	99.937
11	44.035	44.775	16.000	15.800	14.000	13.500	22.500	99.125
18	43.605	45.313	16.000	15.800	14.000	13.500	22.500	100.125
25	45.906	47.088	16.000	15.800	14.000	13.500	22.500	103.050

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Feb. 1956	Silver (c) New York	Silver London	Sterling Exchange "Checks"	Gold London	Gold (d) United States
1	90.125	76.625d.	280.6562	249s. 3⅛d.	$35.00
2	90.125	76.625d.	280.6607	249s. 3⅛d.	35.00
3	90.250	76.625d.	280.6250	249s. 3⅛d.	35.00
4	(e)	(e)	(e)	(e)	35.00
6	90.250	77.750d.	280.6250	249s. 3⅛d.	35.00
7	90.250	77.750d.	280.6696	249s. 4d.	35.00
8	90.500	77.750d.	280.6562	249s. 3½d.	35.00
9	90.750	78.250d.	280.6339	249s. 3⅜d.	35.00
10	90.750	78.500d.	280.4285	249s. 4½d.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	Holiday	79.000d.	Holiday	249s. 5½d.	Holiday
14	91.000	79.250d.	280.4687	249s. 5⅛d.	35.00
15	91.375	79.250d.	280.3214	249s. 5⅛d.	35.00
16	91.375	79.250d.	280.4910	249s. 7⅛d.	35.00
17	91.625	79.250d.	280.6339	249s. 3½d.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	91.625	79.250d.	280.6875	249s. 3⅛d.	35.00
21	91.625	79.375d.	280.6830	249s. 2½d.	35.00
22	Holiday	79.375d.	Holiday	249s. 2⅝d.	Holiday
23	91.625	79.375d.	280.7187	249s. 3d.	35.00
24	91.625	79.375d.	280.7500	249s. 2⅝d.	35.00
25	(e)	(e)	(e)	(e)	35.00
27	90.750	79.500d.	280.8125	249s. 2⅛d.	35.00
28	90.750	78.875d.	280.8437	249s. 1d.	35.00
29	90.750	78.875d.	280.8883	249s. 1½d.	35.00
AVERAGES FOR MONTH					
Feb.	90.901	78.565	280.645	—	35.00
AVERAGES FOR WEEK					
Feb.					
1	90.025	—	280.694	—	$35.00
8	90.275	—	280.647	—	35.00
15	90.969	—	280.463	—	35.00
22	91.563	—	280.624	—	35.00
29	91.100	—	280.803	—	—

Calander Week Averages: New York Silver: Feb. 4th, 90.100; 11th, 90.500; 18th, 91.344; 25th, 91.625.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash. New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Feb.	COPPER Cash Bid	COPPER Cash Asked	COPPER 3 Mo. Bid	COPPER 3 Mo. Asked	LEAD Current Month Bid	LEAD Current Month Asked	LEAD 3 Mo. Bid	LEAD 3 Mo. Asked	ZINC Current Month Bid	ZINC Current Month Asked	ZINC 3 Mo. Bid	ZINC 3 Mo. Asked	TIN Cash Bid	TIN Cash Asked	TIN 3 Mo. Bid	TIN 3 Mo. Asked
1	398	399	381	382	117	117½	114¼	114½	99½	100	95¾	96¼	786	788	772	773
2	393	394	377½	378	116¾	117	114	114¼	99¼	99½	95¼	95¾	775	777½	757½	760
3	390	391	376	376½	115¾	116¼	112¾	113¼	98¼	98½	94¾	95	765	767½	752	753
6	397	398	380	380½	116¼	116½	113¼	113½	98	98½	94¾	95	765	767½	751	752
7	400	401	382½	383½	115½	115¾	112½	112¾	98¼	98½	94¾	95	778	780	759	760
8	398½	399	379	380	115¼	115½	112	112¼	98¼	98¾	94½	95	786	788	767	768
9	400	400½	381	381½	115¾	116	112¼	112¾	98	98¼	94¼	94¾	779	780	757	758
10	396½	397	379½	380½	116¾	117¼	113	113½	98¾	99¼	95	95¼	782½	787½	759	760
13	394	394½	377	378	118	118½	113¾	114	99½	100	95	95¼	787½	792½	760	763
14	398½	399	382½	383	119½	119¾	114¾	115	100½	100¾	96	96½	805	807½	774	775
15	400½	401	384	384½	118½	118¾	114¼	114½	100	100½	96	96¼	802½	805	773	775
16	395½	396	380	381	118	118½	114¼	114½	98¾	99	94¾	95	796	797	766	767
17	397	398	382½	383½	119½	119¾	115¼	115½	99¾	100	96	96¼	804	805	768	770
20	406	406½	393	393½	121½	122	117¾	118¼	101¼	101¾	97	97½	805	810	775	780
21	406¼	407	393¼	394	120½	120¾	116½	116¾	101	101¼	96½	97	815	820	778	780
22	417	417½	405	406	121	122	117½	118½	102	103	98	98¼	820	825	777½	782½
23	416	417	404	405	123½	124	119¼	119½	102¼	102¾	98	98½	830	832½	790	792½
24	421	422	409	410	124¼	124½	119¾	120	103	103¼	98½	98¾	855	860	807½	810
27	412	414	403	405	123¾	124½	119	119½	103	103¼	98½	98¾	885	890	820	825
28	416	417	405	406	121½	121¾	116¼	116½	102½	102¾	98	98¼	830	835	785	790
29	418½	419	408	409	124½	125	118	118¼	102½	103	99	99¼	830	835	782½	785
Av'g's	£403.798		£389.143		£119.375		£115.423		£100.405		£96.375		805.524		£774.048	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb unless otherwise noted.

MISCELLANEOUS METALS

Feb. 29, 1956

Aluminum ingot, 99 plus % lb			24.4¢
Antimony, spot, lb, less than carload, in cases			36.47¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb			$2.25
Cadmium, commercial sticks, delivered, lb			$1.70
Calcium, lb, ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb, contract			$1.25
Cobalt, 97 to 99%, per lb			$2.60
Germanium, per gram, 10,000 gram lots	44½¢	@	48½¢
Indium, troy oz			$2.25
Lithium, lb, 98%	$11.00	@	$14.00
Nickel, cathodes, lb, f.o.b. Port Colborne (a)			64½¢
Magnesium, 99.8%, carloads, lb, producer's plants, Freeport, Texas			32½¢
Palladium, troy oz	$23.00	@	$24.00
Platinum (wholesale lots) troy oz	$97	@	$111
Quicksilver, flask of 76 lb, 25 flasks or more	$264	@	$267
Selenium, 99 plus %, lb. (Feb. 1)			$13.50
Silicon, minimum 97%, carloads, lb			20½¢
Tellurium, lb	$1.50	@	$1.75
Thallium, 100 lb or more, lb			$12.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb			(b)$3.45

(a)Includes U. S. duty. (b)Effective Nov. 23, 1955.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$37.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$23.50	@	$24.50
48% Cr_2O_3 3 to 1 ratio	$44.00	@	$53.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$11.25
Mesabi bessemer			$11.10
Mesabi, non-bessemer			$10.95
Lead (Galena), 80%, Joplin, Mo., ton			$201.32
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties $1.18 @ $1.20 c.i.f. U. S. ports, duty extra, nominal. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb of Mo f.o.b. mines	$1.10	@	$1.15
Columbium-Tantalum, per lb, combined oxides	(a)$1.35	@	$1.50
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$34.00	@	$34.50
Domestic, scheelite, 60% f.o.b. mill			$63.00
Vanadium Ore, per lb of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton			$84.00

(a) Nominal.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb, in bbl carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb	$1.96	@	$1.98½
Copper Sulphate, 100 lb			$15.70
Germanium Oxide, gram			27½¢
Molybdic trioxide, technical, per lb of Mo	$1.30	@	$1.33

ALLOYS

Ferrochrome 65 to 70%, per lb of Cr. (4-9% C)			26½¢
Ferromanganese, 74 to 76%, per lb., shipg. pt.			10.25¢
Ferromolybdenum, 55 to 65% Mo, lb of Mo contained	$1.54	@	$1.66
Ferrosilicon, 50% per lb of Si f.o.b. shipping point			12¾¢
Ferrotungsten, 72 to 82%, lb of W contained (eff. Feb. 1)			$3.45
Ferrovanadium, per lb of V delivered	$3.10	@	$3.45
Silicomanganese, max. 1½% carbon, lb, contracts			11.5¢
Spiegeleisen, per long ton, 19 @ 21% grade			$91.50

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$1,400	@	$1,725
Crude No. 2	$750	@	$1,100
Spinning fibers	$350	@	$650
Shingle fibers	$190	@	$210
Paper stock	$114	@	$137
Waste	$82	@	$84
Shorts	$28	@	$75
Asbestos, f.o.b. ,Vancouver, B. C. (U. S. funds) :			
Spinning fiber	$460	@	750
Shingle fiber	$185	@	$300
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353	@	$383
Shingle stock	$172	@	$190
Paper stock	$114	@	$145
Waste, stucco or plaster			$82
Refuse or Shorts	$39	@	$72
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton			$16
Bauxite, long ton, f.o.b. point of shipment:			
Domestic crude, 50 to 52% (not dried)	(a)$5.00	@	$5.50
Domestic, chemical, 55 to 58%	(a)$8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(a)$18.00	@	$18.50
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.25
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$33	@	$35
60% effective CaF_2	$28	@	$30
Acid 97% concentrate, bulk, ton			$47.50
Fuller's earth, f.o.b. Georgia or Florida ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$40.00
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, prime, Texas, mines, long ton			$26.50
Talc, f.o.b. works, ton:			
New York, purified	$18.50	@	$20.00
Vermont, extra white			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$58.50
Steel f.o.b. Pittsburgh, billets, net ton			$68.50
Structural shapes, Pa., Ala. etc., 100 lb	$4.50	@	$4.60

Anaconda Plans Development Of 78-Million Ton Orebody

DRILLING SINCE 1952 has developed approximately 78-million tons of 1.6% copper ore at Indio Muerto, site of Andes Copper Mining Co.'s operation 18 miles north of Potrerillos, Chile. Roy H. Glover, chairman of the board of Anaconda Co., told Chilean president Carlos Ibanez del Campo that his company's subsidiary will spend some $52,950,000 to develop the orebody.

Output from Indio Muerto is expected in four to five years, or just about the time that the famed Potrerillos mine will be exhausted. Andes Copper will use facilities at Potrerillos to beneficiate the Indio Muerto ores, following modernization and expansion at the old plant.

Included in the plan for new installations and revisions at Potrerillos is a provision to reclaim molybdenum ores as by-product. Output from the plant after improvements is set for 25,000 tpd ore capacity and annual output of 100,000 short tons of fine copper.

And Chuqui, Too

Other proposals for expansion in Chile will be made by Anaconda subsidiaries, according to Glover's presentation to President Ibanez, including one for recovery of molybdenum from the Chuquicamata mine, operated by Chile Exploration Co. Molybdenum is said to be increasing at depth at the mine and is also present in "higher quantities" in Indio Muerto's deposit. "As further work proceeds on the Indio Muerto district," a company spokesman said, "a proposal to invest in plant and equipment to recover molybdenum will also be made."

Glover also announced that Chile Exploration will shortly make presentation of a project to partly revise its electrolytic tank house from an extractive operation to an electrolytic refining operation. Also that Andes Copper contemplates making a similar proposal at a later date. The changes would "place in effect processes whereby copper now produced in the form of blister copper would be refined in Chile in electrolytic form."

The Anaconda board chairman cited the provisions of Chile's new copper law (*E&MJ*, June 1955, p. 72) which provides an improved climate for mining investment in that nation. Since enactment of the new law, investment programs by subsidiaries of Anaconda have been proposed to the total of $100-million. This, combined with the $126-million recently invested in the sulphide plant at Chuquicamata, makes a total of more than a quarter of a billion dollars, "easily the largest investment program ever undertaken in Chile."

A total of six or seven years will be required to bring Indio Muerto's mine and the improved Potrerillos plant up to full production, company officials say. Figure for estimated tonnage is almost sure of being increased, since current drilling has been pretty much confined to the Turquoise Gulch area of Indio Muerto, and there are other promising areas which Anaconda will soon begin testing with drilling rigs.

Mining Methods Planned

Current plans for the extraction of copper from the deposit are outlined by company officials as follows:

Main haulage tunnel will be driven in the Turquoise Gulch area. Inclined shaft will go to working levels from a point near the area to handle service, personnel and materials. Ore will be caved to the main haulage tunnel, coarse-crushed and stored in bins underground. Power substation, compressor plant, shops and ventilating fan will all be located near the mouth of the tunnel.

A 15.5-mile meter gage railway will haul ore to the fine crushing plant at Pasos Cerrados Canyon. Crushed ore will then be transported some 3 miles by conveyor belt to Potrerillos flotation mill. Indio Muerto ore reportedly contains no oxidized zone, so beneficiation will be simpler than for the Potrerillos. A tailings dam and auxiliary installations to impound tailings will be built at the plant.

Surface facilities at the mine include a townsite, transmission lines and water lines and other structures.

Change in Ore Reserve Picture May Delay Purchase of Utah's Happy Jack Property

A HITCH in the sale of the famed Happy Jack uranium mine in White Canyon, San Juan, Utah, is said to exist because ore reserves studied by National Mining & Milling Co. (See *E&MJ*, December 1955, p. 73) did not measure up to expectations.

Joe Cooper, one of the owners of the property confirms that the "actual sale of the property has been deferred," but will make no further comment.

After a 30-day reconnaissance, National reportedly has arrived at the conclusion that reserves don't reach the level claimed for the mine in earlier discussions with representatives with Cooper and Fletcher and Grant Bronson.

Thus the option which was initially given to Barlu Oil Corp., Dallas, Tex. and then transferred to National Mining has not been taken up as yet.

Instead, National Mining has made the owners a "counter proposal" which, according to Ted Bares, vice president of Foley Brothers of New York, would have net effect of increasing down payment but reducing over-all ultimate payment based on potential, future reserves at the mine.

Foley is one of the partners in ownership of National Mining and Milling along with Christiana Oil Co. of Denver, Edward C. Simmons of Los Angeles and L. W. Douglas, of Tucson, Ariz.

While the actual, specific details of the option have never been publicly disclosed, those involved in the transaction have conceded that the option contained the following features:

1. A staggered cash down payment to be made over a number of years.

2. A sliding scale additional payment, which could bring total price to $30 million, based on recovery of ore reserves above and beyond that originally determined at date of the sale.

3. A determination of ore reserves through drilling, geology, drifting during life of the option.

It is of course, this latter work which has impelled National Mining to seek revision of the sale agreement.

One of the principals to the transaction says that National Mining believes there are proved reserves of about 400,000 tons of uranium ore at the Happy Jack Mine right now.

This is about 100,000 tons less than that claimed by Col. T. R. Gillenwaters, Grand Junction, Colo., who represented the Copper-Bronson ownership of Monticello, Utah.

The reserve situation will continue to be "a matter of some debate."

Despite the present problems, National Mining is very desirous of working out a deal with the mine owners, Mr. Bares states.

(*Ed. note*: Apparently the talks did not succeed before option expired. p67)

Jones & Laughlin Studies Quebec Iron Ore Deposit

AGREEMENT between Jones & Laughlin Steel Corp. and Quebec Cobalt & Exploration Ltd. has been announced by Arnold Hoffman, president of the Quebec firm under which J&L will investigate a

hematite deposit in the Mt. Wright area of New Quebec, 190 miles north of Seven Islands and 40 miles west of the Hollinger-North Shore railroad, which serves the Knob Hill-Labrador deposits 180 miles further north.

Under the agreement, J. & L will conduct exploration drilling at the Quebec Cobalt & Exploration property, where Hoffman says his company has outlined a large orebody of 32% Fe content. Deposit is coarse hematite, with some magnetite.

Should J&L decide to go ahead with the project after the two-year period, plans will be made for a beneficiating plant. The Quebec firm will receive royalties on operation.

Utah Miners Address Mine And Mineral Students

UTAH'S MINING LEADERS are bringing the facts of mining life before students at the University of Utah's College of Mines and Mineral Industries. During the next several weeks, the officials will discuss a variety of industry subjects before classes.

Major speakers are Miles P. Romney, manager of UMA; Blain Watts, ore buyer for USSR&MC; Otto Herres, vice president, Combined Metals Reduction Co.; Richard N. Hunt, vice president and chief geologist, USSR&M; and S. D. Michaelson, chief engineer, western mining division, Kennecott Copper Corp.

Mining Calendar

American Congress on Surveying and Mapping—American Society of Photogrammetry consecutive meetings, Shoreham Hotel, Washington, D. C. March 18-24.

Regional Reactive Metals Conference, Niagara Frontier section, AIME, March 19-21, Buffalo, N. Y.

Symposium on Extraction Metallurgy of some of the Less Common Metals. March 22-23, London, England.

Canadian Institute of Mining and Metallurgy, annual meeting, April 9-11, Quebec City.

Symposium on Rock Mechanics, sponsored by the Colorado School of Mines, Golden, April 23-25.

Institute of Lake Superior Geology, Houghton, Mich., May 11-12.

Michigan Engineering Society, annual convention, Pantlind Hotel, Grand Rapids, Mich., May 11-12.

Industrial Nuclear Technology Conference, on uses of radioactive materials in industry, including radiation sources and nuclear instrumentation. Co-sponsored by *Nucleonics* magazine and Armour Research Foundation. Chicago, Ill., May 15-16.

As we went to press . . . .

Another big taconite project is underway, this time in Michigan's Upper Peninsula, where Cleveland-Cliffs Iron Co. and Inland Steel Co. have joined in an undertaking to beneficiate the tough "jasper" of the area. The 33% Fe ore will come from mines at Palmer and Republic, on the Marquette Range.

Each mine will have its own crushing, grinding and concentrating plant and will ship to Negaunee, where pelletization will be carried on. P. D. Block Jr., senior vice president of Inland, says the two mines have some of the best low-grade in the Lake Superior district and exploration shows open pit operation possible to a depth of 500 ft or more. Estimated top capacity of the mines is said to be 1.5-million tons concentrates per year each, with the first to go into production later this year.

Calera Mining Co. (Howe Sound Co.) has started up a 250-lb per day electrolytic pilot plant for production of cobalt metal of high specification. If the pilot plant is successful, Calera reportedly will go ahead with 8,000 lb per day electrolytic output at its Garfield, Utah, refinery. At present, Calera produces a granular form of the metal, made to Government specification and of lower grade.

Walter Renton Ingalls, 91, chief editor of *Engineering & Mining Journal* from 1905 to 1919, died Feb. 25. Mr. Ingalls, one of the most respected members of his profession, was credited in the 75th anniversary issue of *E&MJ*, published in August 1941, with having "developed the method of market reporting that gained world-wide acceptance for '*E&MJ* metal prices.'" During his tenure he also broadened the scope of the journal, paying increasing attention to technological advances and industry growth.

Bear Creek Mining Co. is reportedly negotiating with Chief Consolidated Mining Co. and Tintic Standard Mining Co. on development of a major exploration program covering claims held by the latter firms in Utah's Tintic District.

James F. Boyd, Bear Creek executive officer and vice president in charge of exploration for Kennecott Copper Corp., confirmed the discussions. "We are interested . . . and will go ahead with it if we can make the right kind of arrangement," he said.

Bear Creek seeks discovery of nonferrous metals, it is reported, and presently operates on the Jenny Lind (exploration) unit in the Eureka-Tintic district, of which Chief Consolidated is a major acreage contributor.

Drilling is underway at the Rio Blanco copper deposit in the mountains near Santiago, Chile, where Cerro de Pasco Corp. is investigating the likelihood of a mining operation. Robert P. Koenig, president of the firm, was at the site in late February. Cerro holds an option to buy the property for $2-million, depending upon its investigation results.

Some 27.8-million tons of ore are proved and assured there, but the mining company indicates that it wishes to know more about reserves and to study the technical problems involved in an area where deep snow obstructs operation for 7 to 8 months of the year.

Behind the By-Lines . . .

G. P. Lutjen

You couldn't throw a rock in downtown Denver in the first week of February without hitting a mining man en route to or from the meetings of the Colorado Mining Association. The huge throngs that threatened to split the seams of the Shirley Savoy Headquarters testify to the virility of CMA and the competent leadership of Bob Palmer and his able associates. The steady growth of the organization (attendance records are being made every year) is a healthy sign for our industry.

Participants at the 1956 assemblage generally fell into one or the other of two groups. One group is interested principally in across-the-board mineral policies and mining technology. The other group takes a mild interest in these problems but uranium, to quote the dungaree set, is what they dig the most. Although there is obviously an overlapping of interest, several suggestions were heard from members of each group that the meeting has reached a size where it could handily divide itself into two annual meetings.

Despite the division of interest, the conference presented a united front on matters of policy, possibly the best indication that whether they mine lead, zinc, gold or uranium, miners everywhere ride the same cage. This is pretty clear in the report of the Resolutions Committee which incidentally departed to some extent from the tradition of their predecessors on the tariff question. But you can read all about that and other CMA happenings on pp 102-105.

Interesting wrinkle at the meeting was the presence of 35 live exhibits, outdoors and at the nearby Mile High Center. CMA officials say this could be a trend if space is available in future years. While looking over the exhibits we got talking with Paul Cook of Denver Equipment Co. who had a trend of his own to report. Seems that Denver Equipment has sold in January alone, half as many of their Mechanical Gold Panners as they sold all last year. Neither of us could decide what this phenomenon portends but if it isn't a straw in the wind, it certainly should be.

Last time we had Andrew Fletcher in for a visit he was waging a debate with Charles Taft on the subject of tariffs. Mr. Fletcher was for 'em and still is. But as he told a large gathering at the Colorado Mining Association, U.S.A.—1956 hardly seems like the time and the place for favorable tariff legislation for hard pressed miners. In place of tariffs, Mr. Fletcher offers a plan that should find favor with the Hard Rock Miners Benevolent and Protective Association and their customers alike. For full details on Dr. Fletcher's new remedy, start right across on the opposite page.

All that stuff about airplanes and electromagnetics stretching over the pages from 84 through 91 was caused by a press conference. Aeromagnetics Ltd. had a group of editors and exploration magnates in for tea one afternoon a few months ago at their Park Ave. diggings. After the presentation of the company's work and capabilities, we cornered John McClusky, their very able geologist-geophysicist and plied him with questions. With the aid of Mr. McClusky's notes and sketches, it was easy to prepare a story that clearly shows what airborne electromagnetics can do for the exploration man, and how it works.

Mr. McClusky also told us one of our favorite There'll-Always-Be-An-England stories. Seems one of their instrument-laden Canso aircraft was plugging along on a survey in Canada when it somehow drifted over the U. S. border. Before you could say "Sir Anthony Eden," U. S. jet fighters were buzzing around, demanding to know, by radio, just what the Canso was doing. No answer. The Canso just kept lumbering along at 135 mph as the pride of the Air Force darted back and forth. The query had to be repeated before the reply came back in a very British, very annoyed voice: "buzz off you blokes, before I shoot you down!"

Only Indios Muertos we had ever heard of, until six months ago, were the Cleveland Indios in the 1954 World Series. Now Anaconda comes along telling one and all that they are preparing to spend $53-million on Indio Muerto, only this is no broken-down ball player from around Lake Erie, but a pretty sensational mining enterprise. How a 78-million ton orebody acquires such a name we do not know. Perhaps it is the brainstorm of a delirious geologist who figures he has found the happy hunting ground for sure. Or maybe it is tagged for a bangtail who wins a flock of races in 1906. Who knows?

What we *do* know is carefully wrapped up in a few hundred well chosen words on p 72, indicating that Indio Muerto is a very live proposition indeed.

One of the things that makes life interesting around the McGraw-Hill shop is the Economics Department. This may sound like backtracking from one who has frequently waxed psychotic on the subject of economists, but the crowd around here packs almost as much oomph into a cold factual report as Monroe does into a Mainbocher dress. Moreover, the monthly report from the Economics Department not only pumps editors full of financial and business wisdom, but also equips them for leaping into the breach of that awkward conversational pause. Viz and to wit:

"The editors of *Aviation Week* virtually blew a gasket when we asked them to help us confirm the rumor that somewhere near as much horsepower per pound is built into some of the Buicks, De Sotos, etc., as there is into a DC-7 or Super Constellation. They got the impression that we had it in mind to put wings on a Buick and take off, and they insisted it wouldn't work. They convinced us, too—but we still remain impressed, and even staggered by the fact—that pound for pound about two-thirds as much horsepower is packed into some of our standard passenger automobiles as there is into the fastest transport planes. The ratio of pounds to horsepower in the Buick Century is about .063, that in a DC-7 about .093."

Why a Healthy Domestic Mining Industry Will Benefit: The United States and The Metal Consumer As Well As The Metal Producer

ANDREW FLETCHER[1]
President, St. Joseph Lead Co.
New York, N. Y.

WHEN I DEBATED a similar subject in this publication two years ago,[2] many of us were greatly concerned with finding a solution to the immediate problems of the domestic mining industry, and the lead-zinc branch of it in particular. Although an emergency solution was later reached in the form of the current stockpiling program, I hope no one believes that the problems of domestic mining have all been solved. Actually they have only been concealed temporarily, not eliminated, and their resolution for better or worse should not much longer be postponed.

In considering measures that would bring a lasting solution to domestic mining's problems, I should like to cover these two main points:

First: My reasons for believing that the maintenance of a healthy domestic mining industry is essential to the best interests not only of the domestic producer of metals but of the United States as a whole, and in particular of the domestic consumer of metals.

Second: An analysis of several methods of maintaining a healthy domestic mining industry. I will test each method by applying to it this four-point yard stick: Is the method effective, fair, automatic and feasible? If not, it will not serve our purpose.

May I point out here that the St. Joseph Lead Co. has substantial investments in mining operations outside the United States, and is also one of the lowest-cost domestic producers of lead and zinc. Our organization thus has an appreciation of both foreign and domestic phases of the problem. Also, I would like to use the lead-zinc mining industry as my chief example because I am more closely acquainted with its activities.

Our past experience in studying solutions for mining industry problems makes it clear that if a program can be supported by everyone—producers, consumers and the Government—its chances of succeeding are enormously improved. In working out such a program, these are some of the special considerations with which we must be prepared to deal:

1. The United States cannot avoid a position of leadership in the Free World today. Therefore, we cannot avoid giving recognition to the effect on other countries of any action we recommend. By "giving recognition" I do not mean instant agreement with whatever our foreign friends ask of us! We should have the wisdom to determine what we must do to preserve our own strength, and the wit, the courage and the tact to convince our friends that it must be done.

2. The economy of the United States requires a growing quantity of metals and minerals. These requirements have grown so rapidly, and our production has fallen so greatly, as to make the United States a net importer of many of them, for example, of copper, lead, zinc, petroleum and iron. We know that domestic consumers will demand an adequate supply of metals at a reasonable price, and we must admit that the adequacy

[1] From a talk presented to the Colorado Mining Association, Denver, Colo., Feb. 3, 1956.
[2] See "More—Not Less—Domestic Production," Andrew Fletcher, *Engineering & Mining Journal*, Vol. 155, No. 3, p 73.

of this supply depends, to some extent at least, on imports.

3. The present Administration in Washington, and it is likely, any future Administration, will probably continue to resist any marked increase in tariff protection for domestic industries. I do not approve of that position. I simply state it as a condition that we must recognize.

4. The domestic mining industry is faced with the unpalatable fact that metals and minerals can, in general, be produced for sale more cheaply outside the United States than inside.

Therefore, whatever course we recommend must consider Administration foreign policy and the needs of domestic consumers, as well as the immediate problems of domestic miners. Is it possible to reconcile these seemingly conflicting interests? To put it quite simply, I do not believe that there can be much choice. We can reconcile these points of view because we have to, and we have to in the best intersts of us all.

For the Producer — A Long-Range Program

I hope that current prices of lead and zinc have not dulled your memory of 1953, of 10c zinc and 12c lead. Keep that memory fresh in your minds, and remember, too, what caused those prices. The collapse of lead and zinc markets, and the closure of so many domestic mines, was the direct result of unrestricted and unneeded imports. This threat to domestic miners has not been wiped out by stockpiling. It can, and will, wreck our markets again and again until we find some equitable and feasible means to control it.

The problem is simply stated. Domestic miners are faced with steadily rising costs, the major elements of which are almost beyond their control. They cannot raise prices too high or they will encourage their competitors in other materials. They cannot sell as low as foreign producers can, because their lower grades of ore and higher wage scales make it impossible. The domestic producer cannot completely satisfy the domestic market, except when demand drops seriously. That is why excessive demands abroad can force domestic prices abnormally high, as they did after Korea in 1951, and excessive supplies abroad can force our markets down to a nonprofit level for many producers, as they did in 1953. Domestic producers were powerless in both instances, and all they ask is a measure of protection should either occur again. Let us keep clearly in mind that our chief objective is to develop a long-range program that will at least protect domestic miners against ruinous floods of unneeded imported metals.

Four Factors to Guide Our Reasoning

1. **The United States cannot avoid a position of leadership in the Free World.**
2. **The United States requires growing quantities of metals and minerals.**
3. **Present and future administrations are likely to resist marked increases in tariff protection.**
4. **In general, metals and minerals can be produced more cheaply outside the United States than inside.**

For the United States — A Strong Domestic Industry

Turning to the mineral needs of the United States, we must consider both the peacetime economy and the defense requirements of the nation. In peacetime, some imports of the major non-ferrous metals are generally required. Therefore, it is not in the interests of either foreign producers or domestic consumers if we set up a scheme to exclude all, or a substantial part, of metal imports. The damage is done not by needed imports, but by unneeded imports.

As to the defense needs of the nation, I could cite no better authority than President Eisenhower's Cabinet Committee on Minerals Policy. In its report to the President, this Committee sought "ways and means of maintaining or achieving proper levels of efficient domestic (mineral) production required as an adequate component of the mobilization base." This Committee also recognized "that a strong, vigorous and efficient domestic mineral industry is essential to the long-term economic development of the United States," and throughout its report re-emphasized that the domestic mineral industry is "an important element of the nation's mobilization base." The truth of this statement is so obvious as to need no reaffirmation. The only problem is how best to assure the kind of thriving domestic industry we are all agreed is essential.

In line with the Committee's recommendation, the President did establish a temporary remedy for the ills of the lead and zinc industry. In lieu of the tariff protection recommended by the Tariff Commission, he set up the current stockpile program. Although this program did bring about higher prices for lead and zinc, it has not materially increased domestic production, which is still considerably below the output of 1951. It has been of at least as much benefit to foreign operators as it has to those of the United States—in fact, I have heard of foreign producers complaining that the existing London metal prices are so high that the competitive position of the metals in European markets is being adversely affected, and production too greatly stimulated. The stockpile program has therefore met the test of effectiveness and feasibility as far as the market price was concerned, but unless our Government is willing to assure that stockpiling will be continued for five or even ten years and is willing to take the world surplus production of lead and zinc, then the stockpiling program falls far short as an automatic or fair device.

Also, in connection with stockpiling, let me warn you of the authorization that the Department of Agriculture has to barter through the Commodity Credit Corp. its agricultural surpluses for strategic and critical materials—in fact, I have been told that the production of fluorspar in Mexico has already been increased through an exchange for wheat, to the detriment of domestic fluorspar producers. The minerals obtained under barter agreements are not automatically placed in the Government's strategic stockpile but are held without restrictions on subsequent resale or use. The barter program may temporarily aid the farm problem, but in addition to possibly annoying many nations whose economies are based on agriculture, it will certainly create new and grave problems for metal producers and consumers. The lesson of history is plain that large-scale Government interference in world commodity markets usually generates confusion and bitterness, and often solves nothing.

For the Consumer — Protection Against Scarcity

Next, let us consider the very important problem—the position of the United States consumer of metals. Many consumers take the view that they are concerned only with obtaining adequate supplies of satisfactory raw materials at as low a price as possible. The place of origin is of secondary importance. There may have been a time when this view could have been justified, but recent experience shows that it is rather shortsighted, if not untenable. Certain pro-

grams the mining industry has offered in the past have met opposition on the part of consumers, largely, I believe, because the consumers were not convinced that the programs, carried out over a period of years, would actually save them money. By presenting the facts on what has happened in the recent past, I hope to convince consumers of metals that their own best interests lie in helping domestic mining. I certainly do not expect that this job will be done on any one occasion or by any one man. It is a job in which we all must join, because our interests are identical. The consumer belongs on our side; it is up to us to show him why.

Fortunately, in so doing, we do not have to deal in theory as to what might happen to consumers under various circumstances. We can cite what did happen to them, and I am prepared to show that what happened to them, in lead and zinc particularly, cost them more money than a market more favorable to domestic mining would have cost them.

Ideas We Must Combat

First, let me outline the ideas we will have to work against. Imagine for a moment the result of following the free trader's suggestion of buying our metals wherever we could get them the cheapest. Production of metals would be stimulated abroad, and in time, because of higher costs, would decline in the United States. The number of U. S. metal producers would narrow down to a very few. Only the lowest-cost producers could survive. Mining's labor force, as well as its "know-how" would decline, and the domestic industry's customary markets would disappear except for those last few producers. But some manufacturers might view all this with equanimity because, after all, they would be getting metals from abroad at low prices.

Sooner or later, however, with domestic production greatly reduced, demand for metals such as lead and zinc would inevitably rise beyond the capacity of foreign producers alone to meet. Such a condition of worldwide scarcity could even happen almost overnight, as has recently happened in the copper industry. The simple force of industrial growth in the world will be enough to bring it about. Left uncontrolled, this situation would obviously result in competitive bidding for available supplies, and in turn, skyrocketing prices. Manufacturers in the United States would turn accusingly once more to domestic metal miners and call for help, just as they have done in past war years.

"Four-Point Yardstick"

Any method of maintaining a healthy domestic mining industry must be tested with this four-point yardstick:

1. **It must be effective.**
2. **It must be fair.**
3. **It must be automatic.**
4. **It must be feasible.**

But the next time there would be few to answer the call, and even with the best intentions in the world, it would take months or years to bring production back to anything like necessary levels. In the meantime, prices of lead or zinc or copper could and would climb beyond any levels they have hitherto reached.

I am convinced there is not the slightest intent on the part of any of my friends among foreign producers of metals to drive prices up at the expense of our domestic consumers. I am sure that they would resist to the best of their abilities an excessive upward movement of prices, because they know, just as we do, the very adverse effect of abnormal prices on our customers. My point is that regardless of their good intentions, they would be completely unable to control the forces thus set in motion. It simply cannot be argued that this would not happen because we have all seen it happen, last year and in the years immediately preceding, not just once but over and over again.

LME's Effect on U.S. Markets

The London Metal Exchange must bear a part of the responsibility for this situation. Because so much metal outside the United States is sold on the basis of London Metal Exchange quotations, there are two points concerning it that U. S. metal consumers ought to realize. These are: (1) The London Metal Exchange (LME) has an extremely powerful effect on U. S. prices of metals, especially now that we are an importing nation; (2) prices on the LME are based on sales of relatively small tonnages of metal. Representing at best a thin market, the LME is therefore extremely sensitive, and its prices fluctuate quite rapidly and widely. In comparison, U. S. metal price quotations are based on actual sales to consumers. On the contrary, LME prices only rarely reflect actual sales to consumers. The LME supplies a means for hedging against price changes or of speculation; it does not, normally, supply metal for consumption. Therefore, the LME does not provide an accurate index of the true supply-demand situation in any given metal. Nevertheless, the LME exerts a powerful influence on U. S. markets, largely through the ebb and flow of foreign metal whose movements are based on LME prices. In general, the greater the influence of domestic metal in domestic markets, and the lesser the influence of imported metal in domestic markets, the less the influence of LME prices on U. S. prices and the greater the stability of U. S. metal markets.

How Consumers Were Hurt

Let me give you four examples of metal markets where domestic consumers recently have had to pay extremely high prices because domestic mine output fell far short of demand and lost out to imported metal in influence on metal prices.

In copper, work stoppages in three of the five major producing areas of the world last year lost a total of about a month's output. At a time when the U. S. price was still 36c a lb, the London Metal Exchange price of copper was up around £400 per ton, the equivalent of 50c a lb in the U. S. As always, in a rising market, the LME copper price led the U. S. price upward; just as in a weak market, the LME price has forced U. S. prices downward. Competitive bidding among consumers for the reduced available supply pushed the domestic producers' price up to 43c a lb, the highest level since 1872. Custom smelters sold at up to 50c, and grey market transactions went even higher. The recent behavior of copper prices is an excellent example for consumers of what happens when domestic producers are overwhelmed by runaway markets.

In mercury, beginning in about 1948, imports from Spain and Italy increased from 13,000 flasks in 1947 to 31,951 flasks in 1948, 103,141 flasks in 1949, and even 56,080 flasks in 1950. Most of the 1949 imports went to the strategic stockpile, but enough went to consumption to submerge the domestic mercury mining industry effectively. U. S. production of mercury dropped from 22,823 flasks in 1947 to 4,312 flasks in 1950. When U. S. demand picked up again with the Korean crisis, U. S. mines could not possibly meet it. Imports

continued at a high rate, but prices skyrocketed from a low of $70 per flask in mid-1950 to over $200 per flask in a matter of months. The high price has only recently begun to encourage U. S. mines to reopen because their owners well knew that they could not compete with the output of foreign mines on straight cost of production basis. Consequently, U. S. consumers of mercury will continue to pay high prices until such time as demand drops or U. S. producers build up production.

In potash, there was an even more striking instance of the effect of curtailed domestic output. In November 1949, the Carlsbad, N. M., mines were shut down by a strike which thus cut off about 80% of potash production in the United States. Almost immediately the price of imported potash was raised from 65c a unit to 80c a unit, to the accompaniment of anguished cries from domestic consumers. Prices returned to normal again early in 1950 when production was resumed.

The Impact of Instability

In lead and zinc, the unreliability of imported metal as a source of supply for domestic consumers is most clearly shown. In 1951, at the height of the Korean crisis when we desperately needed metal, imports of zinc dropped over 40% from the previous year's rate. Lead imports dropped 60% at the same time, because—higher LME prices had made it more profitable for foreign producers to sell outside the United States.

Within 12 months the speculative orgy abroad had spent itself, metal was again in good supply, LME prices dropped and metal came flooding back to the U. S. in search of dollars. Imports of zinc rose 270% in 1952; imports of lead rose 280%, both to all-time highs. Naturally, U. S. lead and zinc prices reflected these gyrations in imports. The dearth of foreign offerings in 1951 raised zinc to 19½c and lead to 19c in the U. S. In 1953, the flood of imports of both metals pushed zinc to 10c a lb and lead to 12c.

I'm sure I don't need to relate in detail what this flood of imports did to domestic lead and zinc mines. Let me point out only that domestic mine output of both metals fell from 388,164 tons of lead and 681,189 tons of zinc in 1951 to 318,985 tons of lead and 465,245 tons of zinc in 1954. Since then, even under the stimulus of the Government's stockpile program, domestic output has risen only slightly. If demand should rise again sharply, domestic output could not keep pace, and sharp price increases would be inevitable.

The best light in which a consumer should view what has happened in lead and zinc, however, is the simple one of cost to himself. A consumer might well consider what the cost of lead and zinc has been during the period I have just described. Between 1948 and 1952, lead and zinc went through a cycle of dropping, rising, and dropping prices. For easier figuring, let us picture a consumer who regularly bought 50 tons a month each of lead and zinc all during this period. He paid $968,034 for his lead and $885,765 for his zinc in that time. If, however, there had been a steady market all that time at 15c for lead and 13c for zinc, he would have paid $900,000 for his lead and only $780,000 for his zinc. In other words, stable markets, even at prices that would then have been regarded as fairly high, would have saved him nearly $174,000 or about 10%.

Lest this period may seem handpicked, so to speak, here is the same calculation for the last five-year period for which I have figures. In the period 1950 through 1954, our consumer would have spent $897,656 for 50 tons a month of lead and $835,408 for 50 tons monthly of zinc. At a straight price of 15c for lead and 13c for zinc, he would have spent more for lead, but his savings in zinc would have put him $53,000 ahead.

In the foregoing calculations, I assumed stable prices of 15c and 13c for lead and zinc because they seemed to me to strike a balance between levels that many consumers would have thought too high at that time, and levels that many of us thought were too low. Actually, with the wage increases granted in 1955, plus probable further cost increases in 1956 if the domestic mining industry is to be maintained on a profitable basis, the consumer should begin to think in terms of generally higher prices for all metals.

Let us then go on to consider how we can bring about a situation of stable and fair prices in view of the fact that in general the cost of domestic production is greater than foreign production.

Tariff — A Simple Solution

The simplest and most obvious method, of course, is a moderate increase in tariffs on imported metals to equalize this disparity in domestic and foreign costs. Unfortunately, the political situation is such that under either a Republican or a Democratic Administration it seems unlikely that such tariff increases will be achieved.

Actually, if the intent of Congress, when it established tariffs on lead and zinc prior to the recent reductions of the so-called reciprocal trade agreements, were to be followed, our tariffs would be well above present levels. Considered on a percentage or ad valorem relationship to former prices, we should now have tariffs on lead and zinc of around 3c a lb at least. At the risk of seeming repetitious after my talk at Las Vegas in October, let me just say that an increase in tariff on lead and zinc would have the following advantages:

It would immediately establish United States prices at a higher level than the rest of the world.

It would aid the American miner who needs help, but it would not unduly stimulate production from foreign miners.

Owing to the higher United States prices, the foreign producers could still market a portion of their output in the United States because they could afford to pay the tariff and still net the same world market price. The United States would thus receive sufficient imports to meet the requirements of our consumers.

The regular flow of lead and zinc ores among nations would still be subject to the conditions of supply and demand and the automatic laws of the market place that are fundamental to our economy. As a consequence, we would avoid the serious risks attached to artificial devices such as cartels, subsidy plans, international stockpile balance wheels, or other forms of Governmental experiments and controls.

In short, a moderate increase in tariff appeals to me as meeting the requirements of effectiveness, automatic operation, and fairness, but because of the present political climate, I am afraid one must regard it as not feasible.

Are Subsidies the Answer?

The free trader's answer to our problem is, of course, to eliminate tariffs, encourage imports of metals, and pay subsidies to any domestic miners who are injured as a result. Subsidies usually lead to stockpiling of surplus metals; they obviously burden the taxpayer; and they inevitably lead to Government control of prices and production. All this, mind you, is in the name of free trade! I urge you not to join the free trader in this distortion of the facts and proclaim that "Subsidized Industry Is Free!" I regret that lack of space precludes a discussion of the faults of a differential subsidy plan, such as the World War II

so-called Premium Price Plan, which would once more develop nothing but inefficiency for domestic mining. Let me simply say that by our yardstick, subsidies fail on the points of effectiveness, fairness, automatic action and feasibility.

Are Quotas Practical?

If one could trust implicitly in the wisdom and speed of some governing body that would constantly and equitably adjust import quotas to just the amounts needed by domestic consumers in excess of domestic production—but no more than that—one could advocate a quota system with some enthusiasm. I can believe that quotas on the fairly simple importation of metals might be feasible, but the problem of establishing quotas on concentrate imports becomes very complex, owing to wide variation in grades and content of impurities. I am afraid that quotas for metals, ores and concentrates, however earnestly they were handled, would be adjusted either too much, too little, or too late. Applying our yardstick to the quota system, I think you will agree that the method would be effective in curbing imports, but would fall short on the counts of automatic operation, fairness and feasibility.

Merits of an Import Tax

As each of the foregoing methods is either politically or "practically" unsatisfactory, we can turn to another method that has been partially applied to copper imports. That is simply an import tax that would be applied automatically to imported metals whenever the domestic price for a calendar month averaged lower than a certain base level. The lengthy discussions of a sliding-scale import tax are probably still fresh in the minds of many readers. I will not pretend that I do not still think that the sliding-scale tax, as originally conceived, has much merit. However, for simplicity's sake, let us confine this discussion to the plain, fixed-unit import tax somewhat similar to that now existing for copper. This is how it would work in the case of lead and zinc.

A tax of 2c a lb would be applied to imported lead and zinc whenever the U. S. prices averaged below a specified base level, which level might well be established initially by the Department of the Interior, possibly working with the Industry Advisory Lead and Zinc Committees and consumer representatives. If 1956 does not bring new wage, freight and other cost increases to non-ferrous metal producers, this base level might be set at lower than present market prices. The tax on concentrates would be 75% of that on metal and on all imports it would probably be practical to consider the date of the bill of lading as the date for determining whether or not an import tax were due. If prices rose again and averaged higher than the base levels for a month, the tax would be suspended. There would be no sliding-scale feature, and the proceeds of this tax would go into the U. S. Treasury.

There is precedent for this type of tax in legislation, as duties on lead and zinc were suspended with the approval of the domestic producers when the domestic prices for these metals during the Korean War were 19c for lead and 19½c for zinc and were reinstated when the prices fell below 18c. The initial 4c import tax on copper, which under the Reciprocal Trade Agreements was reduced to 2c, was suspended when the domestic price exceeded 24c, and the 2c has not been reinstated, as the domestic copper price has not again fallen to 24c. Since this principle has been accepted by Congress, the proposal of an import tax for lead and zinc should prove acceptable, especially with the automatic suspension of the tax when the domestic price is higher than the specified base level.

Four Methods Tested

1. **Tariffs—Effective, fair, automatic, but not feasible because of the political climate.**
2. **Subsidies—Not feasible, fair, effective, nor automatic.**
3. **Quotas—Effective, but not fair, feasible or automatic.**
4. **Import Taxes—Most nearly approach meeting the test requirements of effectiveness, automatic operation, fairness and feasibility.**

"Boom-and-Bust Cycles"

Next, what would this tax do for the domestic miners? I believe it would solve their primary problems, the ironing out of the cost advantage enjoyed by foreign producers when the market price is below the specified base level. Beyond that, this tax would tend to stabilize markets at about the base levels chosen because it would serve as an approximate ceiling as well as a floor. Thus there would be a tendency to end the boom-and-bust cycles of the last decade. These effects of the import tax would be of tremendous help to the majority of U. S. lead and zinc miners—but how would domestic consumers benefit? I have already indicated how U. S. consumers would benefit financially through stable metal prices, I think the tax would help bring this about. Beyond that, they would enjoy a steadier and more reliable source of metals in a flourishing domestic mining industry that would not, like the foreign producers, be inclined to seek the better markets.

How would foreign producers be affected? One would hardly expect foreign producers to be enthusiastic about the import tax, but at least they could take comfort in the fact that of all the devices the United States might adopt to insure a healthy domestic mining industry, this import tax is the least troublesome to them, except possibly a direct subsidy to domestic miners, or an indefinite continuation of stockpiling. There would be nothing but the present minor tariff on imported metals as long as prices were high enough to sustain domestic production. Foreign producers can hardly quarrel with that situation. When prices fell, the 2c tax would act to discourage excessive imports that could only drive prices lower for all producers. After all, a healthy mining industry in the United States is quite as essential a defense measure for other nations of the Free World as it is for the United States. The import tax is a way of minimizing the inconvenience to other nations while we protect an essential industry of our own.

Applying the Yardstick

In conclusion, let me, for the last time, apply my yardstick to this method of the automatic import tax. Is it effective? Yes, possibly not as effective as quotas, but at least as effective as a tariff. Is it automatic? Yes, the mechanics could be clearly stated, easily understood, and would operate smoothly. Is it fair? Yes, because it protects the domestic miner, but does not penalize needed foreign production. It will sustain about the present market, and will increase market stability. Is it feasible? Quite likely.

It seems clear, therefore, that an import tax, applied as I have outlined, most nearly approaches meeting the test of effectiveness, automatic operation, fairness and feasibility. It remains then to convince consumers of our products that maintenance of a healthy domestic mining industry is in their best interests; second, to work out an equitable method for reaching that goal.

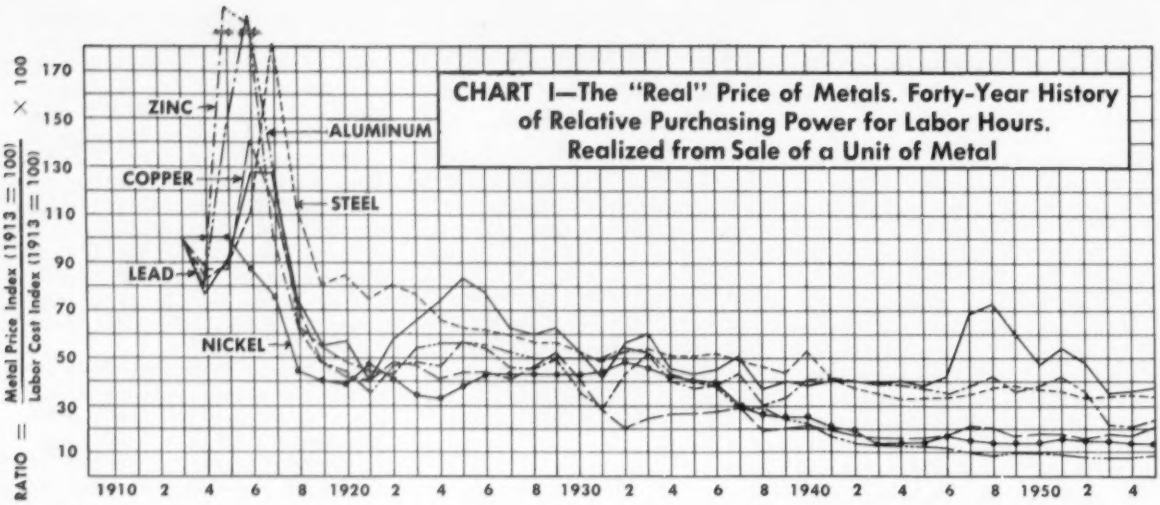
CHART I—The "Real" Price of Metals. Forty-Year History of Relative Purchasing Power for Labor Hours. Realized from Sale of a Unit of Metal
ZINC
ALUMINUM
COPPER
STEEL
LEAD
NICKEL
RATIO = Metal Price Index (1913 = 100) / Labor Cost Index (1913 = 100) × 100
170
150
130
110
90
70
50
30
10
1910 2 4 6 8 1920 2 4 6 8 1930 2 4 6 8 1940 2 4 6 8 1950 2 4

CHART I. The "real" price of metals is based upon the relative number of labor hours that each day will buy. Base, 1913 = 100.

How to Insure a Better Future For the Western Mining Industry[1]

FRANK G. BREYER
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THE TIME WHICH YOU DEVOTE to studying this article will be well spent if you retain these five points in mind:

1. That alleviation of the U. S. nonferrous metal mining industry's present distress can be had only through political action directed at the Federal Government.

2. That there is no factual basis for assuming even a short term plateau much less a declination in the world-wide inflation spiral. For you and for me, the best measure of inflation is the cost of the consumed labor hour or the cost of new plant and production facilities.

3. That thinking in our field is much clarified if prices, whether for ore, concentrates, or for metal, are calculated and charted in terms of their purchasing power for labor hours as well as in cents or dollars. Ninety percent of all costs, direct and indirect, are for the consumed labor hours required for production. In the case of metals, mining and concentrating is, of course, the first step in production.

4. That valid projections for future metal economies are good in proportion as the data back of the projections cover the entire period of the inflation from 1913-14 to date, and in proportion as they portray the heavy tonnage metals as a unit and relate them one to another.

5. Mineral reserves in the ground, including oil, gas and sulphur, have by and large proven to be excellent investments over the forty-one years of the world-wide inflation and are likely to improve in the future.

Chart I, embodying the findings of ten or more years of continuous checking of records and statistics, shows the 41-year history of what you *really get* besides paper when you sell your ore, concentrates or metal. Whether you get dollars, checks or ledger credits (all paper) is merely a bookkeeping device. It is the purchasing power of that paper for labor hours that you have really exchanged your metal for, since, as I have said above, 90% of all costs are for labor, direct and indirect.

Chart I shows the *real price history* over the past forty-one years of the six common and tonnage metals; namely, steel, copper, aluminum, zinc, lead, and nickel. They are put together because the metal fabricating industry consumes them all. They are to a limited extent substitutable one for another, and they are sold and bought in large tonnages by a limited number of sales managers and purchasing agents. They move pretty much together in response to the moves of the most common cost denominator (the cost of the consumed labor hour), and they respond for the short term to a more or less common market-place psychology.

Two striking things about these curves are the contrasts between the real price of metals in the First World War, and in the Second; the intervals from 1914 to 1918 on the one hand,

[1] From a talk presented at the Colorado Mining Association, Denver, Colo., Feb. 3, 1956.

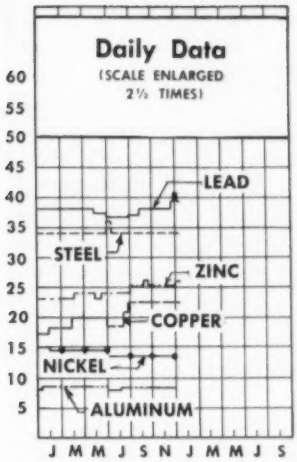


CHART I continued, by months.

and from 1941 to 1945 on the other. In the First World War, the selling price of the metals in cents and dollars outpaced the selling price for labor hours in a most astonishing way (see left hand side of chart). In consequence, the spread or profit money all went to the entrepreneurs of labor; the stockholders or producers.

In the Second World War, with the Government in complete control of the price of metals but not in control of the cost of labor hours, the selling price of the labor hour violently outpaced the selling price of the metals. Most of the money went to labor and taxes and not to stockholders. This study of the chart reveals clearly why the prices of metals had to drop after the First World War and why they had to rise after the Second.

Furthermore action by the Federal Government in the case of the Second World War was effective in stabilizing the market and getting money to pay high miners' wages. Many ways for alleviating the present distress of the Western miner have been proposed and are open for debate, but it is very difficult, if one is a realist, to overlook the fact that the Federal Government did a good job of control once, and presumably could do it again. This is the first support for my Point One.

Another striking thing about these curves is that they all run downhill from the left hand side of the chart to the right side. That means less and less labor hours in return for the paper money which is received for a ton of metal each year. In other words, the real trading power of the commodity has been steadily declining since the end of the first war. It has declined to the point where the spread and profits are so low that management has little surplus with which to buy and construct new units of production. It has to borrow the money—and where does it get the money? It gets it where labor deposited it shortly after receiving it from you, namely from the savings banks, insurance companies, trust and pension funds, and finally the labor's own union fund accumulations (a $500-million per year take for United States and Canadian unions).

To go back and be precise about how the real trading value of a ton of zinc, for example, has steadily declined, let's examine the exact figures. The amount of zinc that would have bought 33 labor hours in 1915 will buy only between five and six labor hours today. In 1951, it would have bought 12 labor hours, in 1933, 17 labor hours and in 1925, 19 labor hours. This range of real returns is not materially different for any of the other common metals. It is obvious that this decline cannot continue in real purchasing power indefinitely. Technological development (a costly and hazardous business) resulting in the consumption of less labor hours per ton of production, has helped and will continue to help in the future, but political action seems essential if the small, medium and/or marginal producer who has no men or money to spend in research is to be kept alive. That insurance money, savings bank or trust fund money is not for him. It is only available for the well established producers with a good credit rating.

Increase in Labor Costs

Chart II makes this point still clearer, in that it shows graphically the 41-year history of the basic factors in zinc smelting economy. Spot checking with several companies indicates that these same factors determine the economy of mining and milling operations as well. The first look at the chart shows immediately that over the years the selling price of labor hours has outpaced the selling price of zinc metal by almost four to one. In response to the greater supply of money and credit as compared to the supply of zinc (inflation), the price of metal has risen about two and one-half times over the 41 year period, roughly from a 5c-6c range to 12c-14c. The cost of the consumed labor hour, however, has risen roughly ten times, from between 15c and 25c an hour to $1.75 to $2.75 an hour. These are total costs including fringe benefits, whose make-up and magnitude will be shown later.

To stay in business you not only have to meet the steadily rising payroll, but you have to make enlargements and/or build entirely new plants. New construction costs five to seven times as much as it used to. That's the middle line. While that line as actually depicted on this chart is the McGraw-Hill construction cost index curve for all types of construction, we have checked its application to new metallurgical construction in a wide variety of metal industries and in a wide variety of plant locations. The figures still come out about on an average of six to six and one-half times today what they were when the inflation began.

To illustrate the point, Anaconda's original electrolytic zinc plant, at Anaconda, cost in 1916 roughly $45 per annual ton of production. Today, figures for electrolytic plants in a variety of locations in the U. S. and Canada run between $275 per annual ton and $335 per annual ton.

It is also obvious from the chart where the most of the dollars realized from the sale of the metal go. They certainly do not land in the corporate treasury, and further, what does land there, after taxes, is not enough to buy a new plant that cost six times what the old ones did, or even three or four times what the old ones did.

Construction money is increasingly coming from the savings banks, insurance companies, trust funds, etc., where labor has deposited it.

The only line on the chart that gives the zinc man an even break is the one marked "Index of Commodities, Wholesale Prices." To the metal or concentrate producer that means supplies. He can get just about as many supplies of all kinds in swap for a ton of zinc today as he could forty years ago, but supplies today are differentially a very minor element in zinc smelter economy as compared to the payroll item.

A Forty-Year Build-Up

These two charts combined not only depict where the industry's trouble is today, but they show that that trouble has been building up for forty years. The forces at work have momentum; they are not just of today or last year. With that much history behind the data, it is a pretty safe bet that unless economics are changed by politics, the overall problem of the zinc industry will continue to worsen, and at an accelerated rate.

Based first on the record of previous inflations the world over, and based more particularly on the average U. S. working man's experience over the past forty years, it is politically impossible to change very much the slope of the curve of the accelerating increase in the cost of the consumed labor hour. The American worker, in

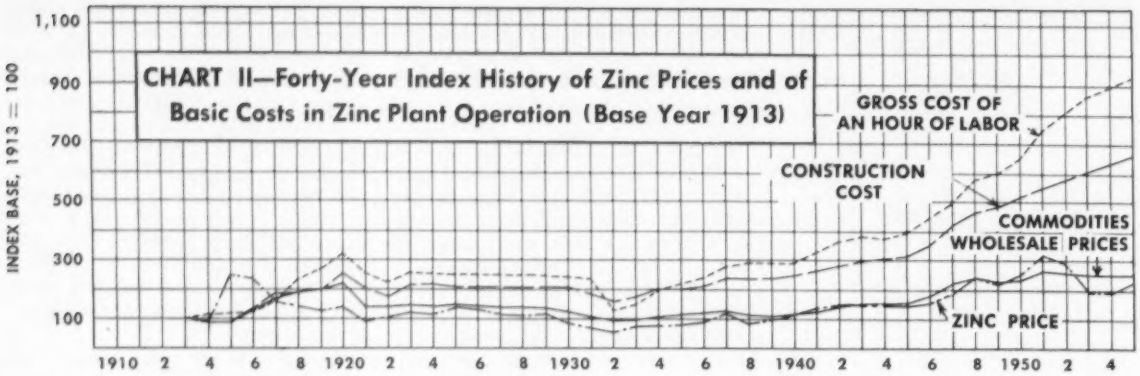


CHART II—Forty-Year Index History of Zinc Prices and of Basic Costs in Zinc Plant Operation (Base Year 1913)
INDEX BASE, 1913 = 100
1,100
900
700
500
300
100
GROSS COST OF AN HOUR OF LABOR
CONSTRUCTION COST
COMMODITIES WHOLESALE PRICES
ZINC PRICE
1910 2 4 6 8 1920 2 4 6 8 1930 2 4 6 8 1940 2 4 6 8 1950 2 4

CHART II. This index compares the price of zinc with basic costs to operate an actual zinc plant. Base for chart, 1913 = 100

every category, has found over the past 40 years that each year, or very nearly each year, he works fewer hours and gets more dollars per day. He has been warned again and again over that 40-year period with the cry of wolf that "you cannot keep it up." But no wolf has come and now he does not believe the wolf exists. Labor is going to keep on demanding more dollars for fewer hours until the final day when the dollars will not buy anything. Any politician who tries to sell Joe Doakes a contrary idea will not get elected, or if elected, he will not stay in office long either here or anywhere else in the world where they hold real elections.

If the above is the situation, the price of zinc must be made to go up with the price of the consumed labor hour, factored wherever it is apparent by the gains due to technological improvement. This is not fomenting or forwarding inflation. It is simply recognizing that it exists and that its most immediate manifestation is had in the payroll. Unless the metal industry wishes to suffer differentially with respect to other groups of citizens, they had better recognize and act in accord with the realities of fiscal life in an era of inflation.

Chart III shows the history and growth of the so-called "fringe benefits" for zinc and a breakdown of its components.

It is obvious that they have implications, social as well as financial, far beyond the fact that they now constitute roughly 20% of the total cost of the consumed labor hour.

The history of the cost of the consumed labor hour in mining and milling parallels quite closely that for smelting labor. There are not too many mines and mills that have their records in such shape and accessibility that a good history can be made, but C. V. Burns, vice president-controller, of the American Zinc, Lead & Smelting Co., has worked up the index history for the Tennessee operations of that company. (See accompanying table.) If charted, these figures will very closely parallel the curves shown for the smelting industries. If there are any differences between mining and smelting figures, my spot checks indicate that they can only be minor and not sufficient to vitiate the conclusions that we may draw from using the smelter figures.

The broadest conclusions to be drawn from these charts, and from other data, are (1) that the paper price of the common tonnage metals will continue to rise in the future with the rise in the total cost of the consumed labor hour, (2) a rise in metal prices will follow more quickly in the future, after a labor cost rise, than it has in the past, because of the squeeze, (3) that the size of plants and installations have about reached their maximum from the standpoint of the effect of size on production costs, (4) that technological improvement, brought about through research and development, is the sole present reliance against the increasing squeeze of labor costs on metal prices, and (5) that the value of mineral reserves in the ground will steadily increase in terms of dollars, but not necessarily in terms of real value. An ore sale for fixed dollars paid not with delivery of ore against it in the future is a good one. A sale of ore now with fixed dollar per ton payment for it in the future is not good.

To return to the thesis: If the Government can hold the price of metals in terms of cents per pound, it can control the price in terms of labor hours purchasable for a ton of metal. I am not suggesting that the Government can hold the selling price of labor hours, far from it. I am only suggesting that it can vary the price of metal with the variation in the selling price of the labor hour. I will make no argument for any specific type of control. I will simply state that all the world uses government controls effectively against us in the interest of their metal producers. History indicates that the most effective way to fight fire is with fire.

Wage-Rate Index of American Zinc Company of Tennessee

Index of common labor and first class electrician wage rates as of Dec. 31 for years 1916 to 1955, inclusive. These are based on actual rates in the East Tennessee mining operations of the company.

At Dec. 31	Percent of common rate at Dec. 31, 1916	Percent of first class electrician rate at Dec. 31, 1916
1916	100%	100%
1917	100%	100%
1918	150%	147%
1919	150%	147%
1920	187%	167%
1921	150%	135%
1922	150%	135%
1923	150%	135%
1924	150%	135%
1925	150%	135%
1926	150%	135%
1927	150%	135%
1928	167%	150%
1929	167%	150%
1930	167%	150%
1931	167%	150%
1932	167%	150%
1933	200%	183%
1934	200%	183%
1935	200%	183%
1936	200%	183%
1937	273%	220%
1938	233%	200%
1939	273%	220%
1940	330%	238%
1941	370%	258%
1942	370%	273%
1943	387%	350%
1944	387%	350%
1945	387%	350%
1946	510%	412%
1947	593%	453%
1948	677%	495%
1949	743%	495%
1950	823%	568%
1951	917%	615%
1952	930%	622%
1953	897%	605%
1954	890%	602%
1955	957%	635%

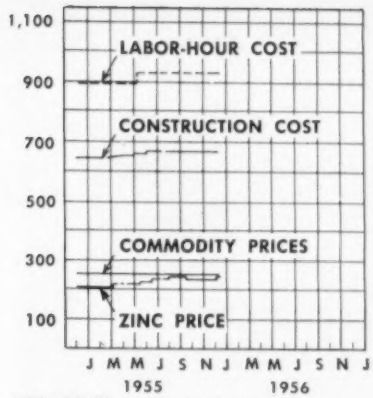


CHART II continued, by months.

Editor's Comment

MR. BREYER'S THOUGHT-PROVOKING PAPER, presented at the recent Colorado Mining Association meeting, has not been published here in its entirety because of lack of time and space to include all of the charts which he prepared. His complete paper included a chart showing the 40-year index history of steel prices and basic costs in steel plant operation (similar to Chart II for zinc). With 1913 as the index base, this chart shows that gross cost of an hour of labor rose from 100 to 1140 during the 1910-1955 period; construction costs rose from 100 to 675; and steel prices rose from 100 to 380 for the same period.

In a similar way, the author's 40-year index of copper prices and basic costs in copper plant operation shows these increases for the 1913-1955 period (1913 = 100): Gross cost of an hour of labor, 100 to 1240; construction costs, 100 to 675; and copper prices, 100 to 275.

Mr. Breyer also presented a chart showing the steel industry labor cost trends similar to Chart III. During the 1940-1955 period, straight-time hourly labor rate index rose from about 340 to 910, and the gross hourly labor cost distribution rose from about 8.3% 1110 during the same period. This comparison between the straight-time index and the gross labor cost index for the steel industry reveals that fringe cost distribution rose from about 8.3% of base pay in 1940, to 21.4% of base pay in 1955. Fringe costs include items shown in Chart III.

Discussion of this paper raised the question as to the effect of changes in productivity on the mining industry. Since no 40-year index studies are available, reference was made to the accompanying chart prepared by the McGraw-Hill Department of Economics from data compiled by the Bureau of Labor Statistics and other sources. Here we note that productivity in the manufacturing industry has increased

CHART III—Zinc Industry Labor Cost Trends

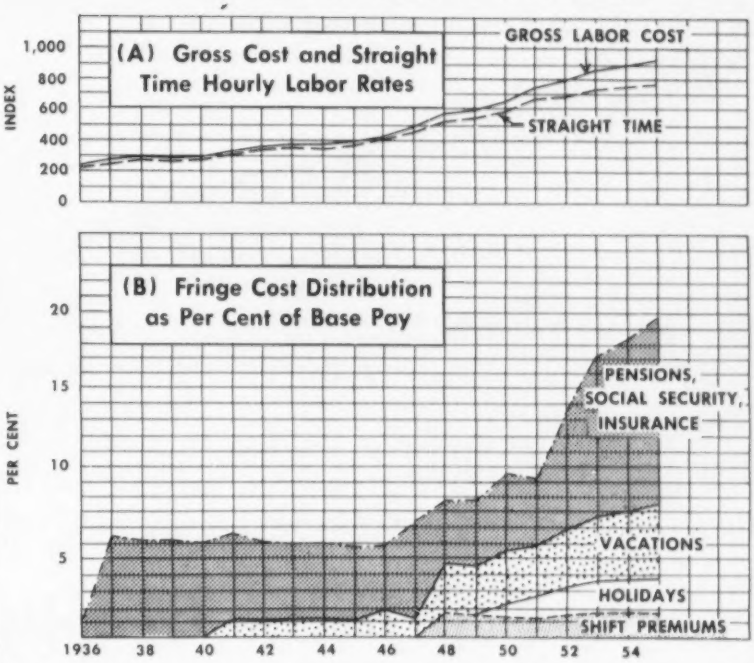
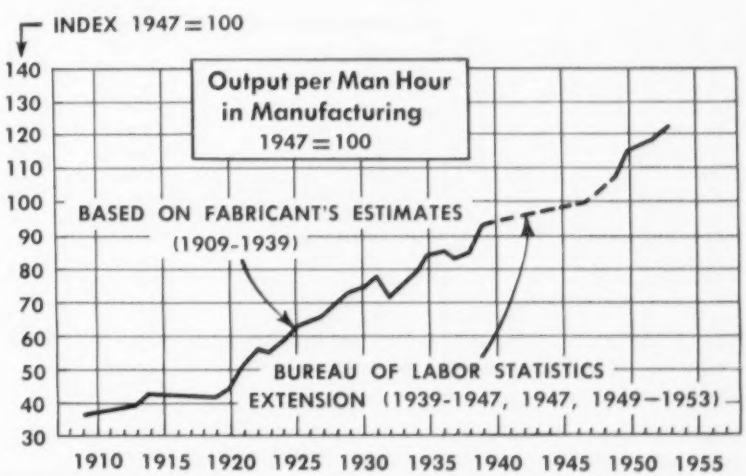


CHART III. Fringe benefits now constitute roughly 20% of the total labor cost. Labor cost data based on average rate for general labor at Mathiessen & Hegeler Zinc Co.

roughly three-fold over a 40-year period. Limited productivity studies made by the U. S. Bureau of Mines, and the Bureau of Labor Statistics for the 1935 to 1952 period indicate that productivity in the mining industry roughly parallels the curve for the manufacturing industry.

Assuming then that productivity increase over the 40-year period was of the order of 3 to 3.5 times, and comparing this increase with the 635 to 957% pay-rate increases on the opposite page, one can readily realize the importance of Mr. Breyer's remarks that technological improvement, brought about through research and development is the sole present reliance against the increasing squeeze of labor costs on metal prices. Obviously, the small Western producer who doesn't have the resources and capital to do extensive research is being hardest hit by this squeeze, and must look in other directions for relief as Mr. Breyer concludes.



PRODUCTIVITY INCREASE for manufacturing has been about three-fold, and limited data indicate a similar 40-year productivity increase for mining.

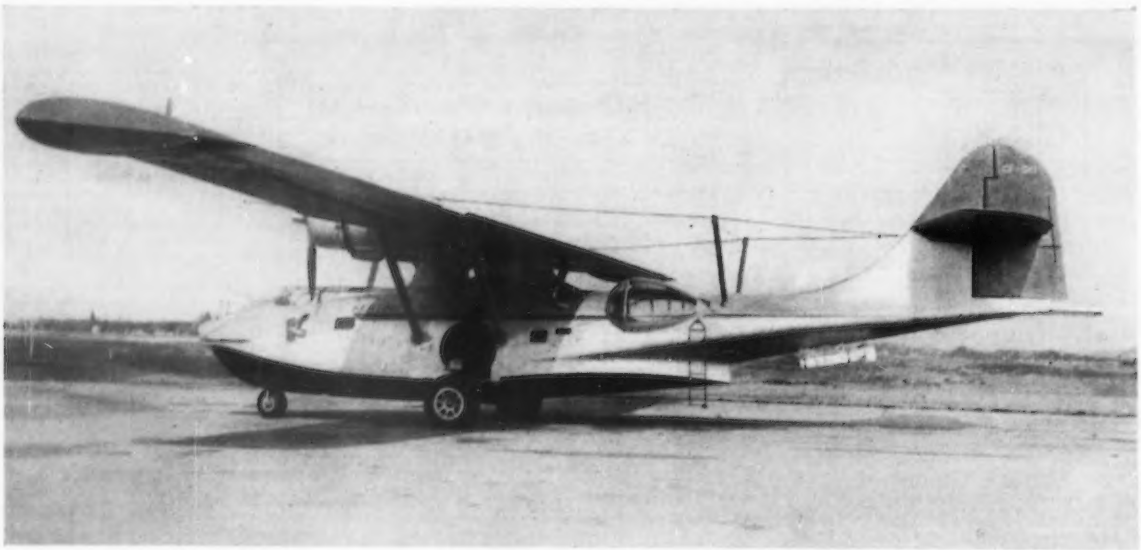
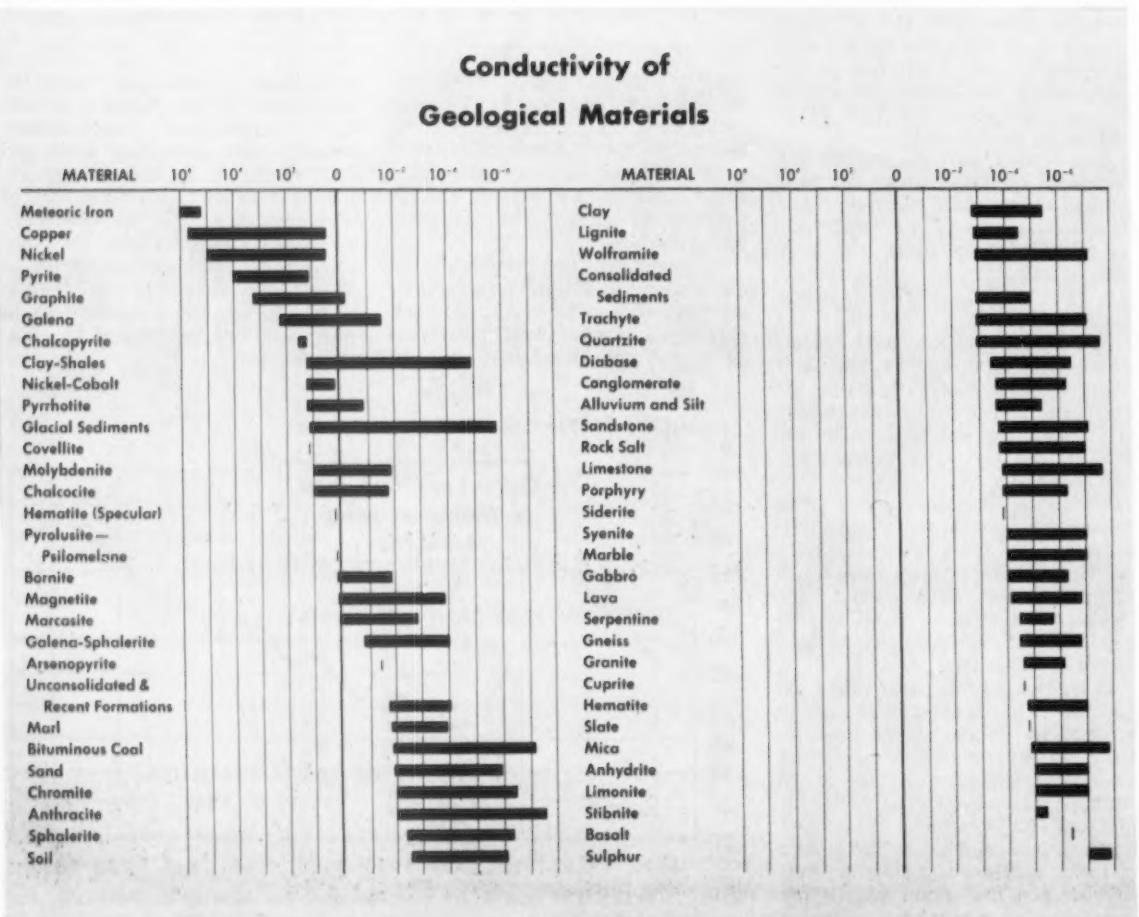
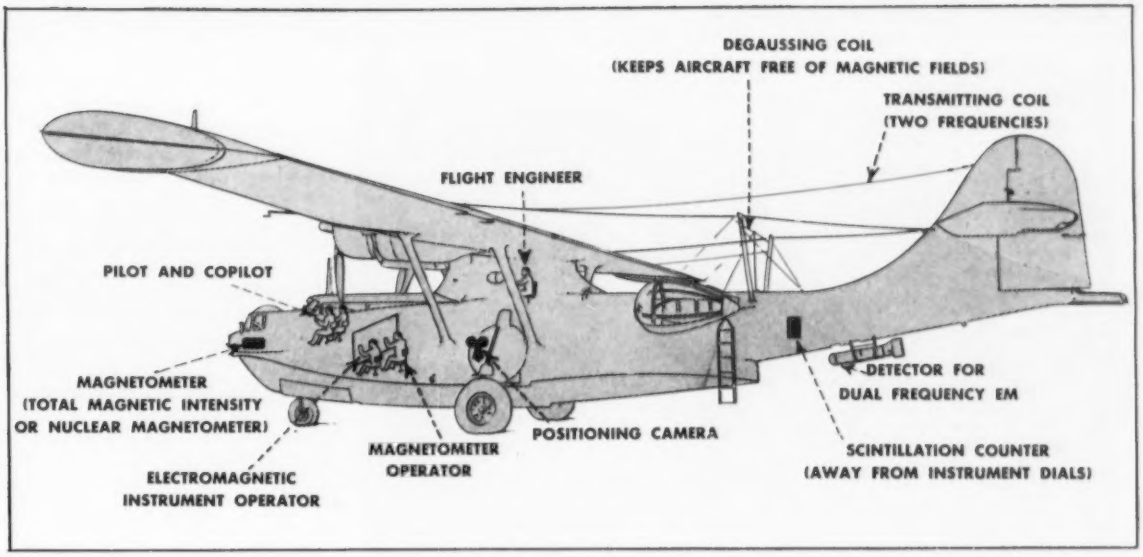


Fig. 1. FLYING GEOPHYSICAL LABORATORY can cover as much as 1,500 line miles a day. Usually flies 500 ft high.

New Airborne Geophysical Method





ELECTROMAGNETIC OPERATOR also checks radio altimeter, scintillation counter. Sixth crewman is electronics technician.

Speeds Prospecting

SPEED IS THE HALLMARK of modern airborne geophysics and by combining the standard geophysical techniques with a dual frequency electromagnetic method, Aeromagnetic Surveys, Ltd., Toronto, can lay claim to speedy prospecting with thorough geophysical coverage of broad areas at low cost.

For modern prospecting, the Canso aircraft, shown above, is an airborne geophysical laboratory carrying over 2,000 lb of electrical equipment. Included are a magnetometer to measure the earth's total magnetic intensity; an electromagnetic bird on 500 ft of cable with two detection coils for low and high frequency; horizontal transmitting coil for both frequencies; compensating coil for low frequency. Other important instruments for geophysical prospecting are the strip camera, scintillation counter and radio altimeter. Most of this equipment is "old hat" to the modern prospector but let's take a closer look at the electromagnetic technique and how it works.

Both low and high frequency fields transmitted from the plane set up their respective resultant fields, depending on the conductivity of ground formation being surveyed. The phase shift between the transmitted field and the resultant field is measured for each frequency. The degree of phase shift is indicative of the conductivity of the material in the geologic formation as shown by the curves in Fig. 2. The key to finding where you are on the curves is the ratio of the low frequency phase shift to the high frequency phase shift. A high reading in a single frequency could mean almost anything but the ratio of the two frequencies pins down the answer and effectively extends the

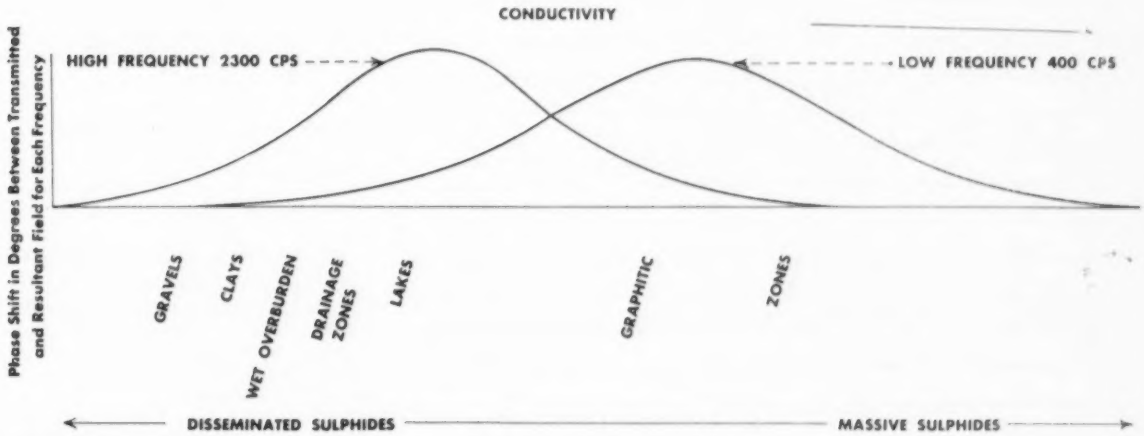
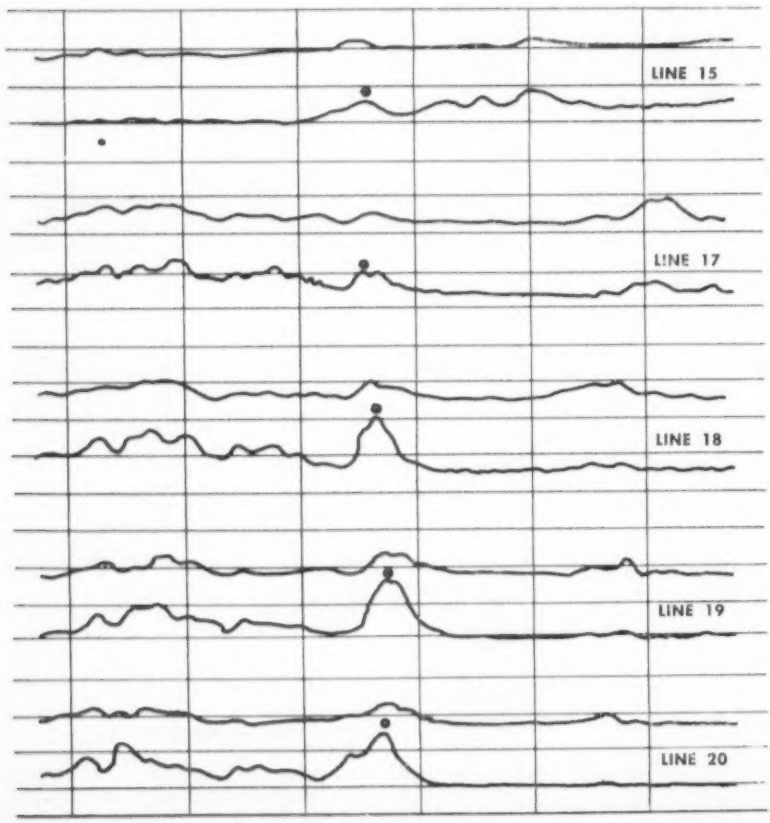


Fig. 2. Horizontal coils on the plane transmit both low and high frequency fields which energize different geologic formations to different degrees setting up a resultant field. Detection coils in the "bird" pick up these resultants and the phase shifts for both frequencies are logged. Ratio of low frequency phase shift to high frequency phase shift shows interpreter where he is.

Fig. 3. Five flight lines (photo above, profiles below) over Ontario Pyrite ore deposit show low response over poor conductors like sandstone, good response over graphitic tuffs and the diagnostic response over the ore zone marked with a dot. It was suspected that graphitic material might mask response over ore zone but that response was distinctly anomalous.



range of the method. It must be kept in mind that values of the phase shift are purely relative.

In actual practice both low and high frequency fields are transmitted by the coils mounted between the wing and the stabilizer of the plane. Resultant fields set up by geologic formations below are picked up by coils in the trailing "bird." The aircraft flies 500 ft above the contours of the ground with the bird 200 ft below.

Success of the electromagnetic survey lies in interpretation. Engineers with Aeromagnetic Surveys emphasize the point that reliable interpretation requires as full a knowledge of regional geology and geography as possible. Graphitic tuffs, for example, will show a favorable response and the interpreter must be aware of them in the area lest he designate their presence as an ore zone.

Lakes can be a problem. Based on the experience of 150,000 line miles of flying the ratio of low frequency phase shift to high frequency phase shift should not exceed 0.4 regardless of the depth of the lake. When this ratio approaches 1.0 over a lake, it's time to get suspicious.

Some of the interesting possibilities in interpretation are shown in Figs. 3, 4, 5 and 6, which serve to illustrate the potential of the electromagnetic technique.

Limitations of the method are few. We have mentioned that sheet conductors may mask sulphide ore zones. Area relief handicaps the Canso but this will be overcome by mounting equipment in helicopters for work in areas of high relief. The fact that conductors will not be energized below a depth of 300 ft is the third limitation. Dip of the formation can be important. If dip is toward oncoming aircraft, response is poor.

For maximum effectiveness in your EM survey, the following steps are recommended:

1. Select an area that research indicates is promising. There is no use wasting your money. This sounds like a belaboring of the obvious but companies offering airborne geophysical services are constantly being approached by naive operators who want vast areas surveyed "blind." Costs are low, but not *that* low.

2. Compile all knowledge there is about the area such as geology, results of any previous geophysical work, drill

(*Continued on p 90*)

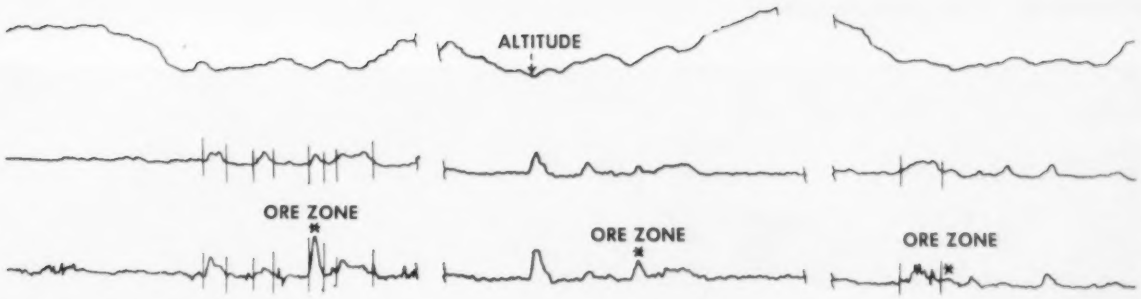


Fig. 4. Three flight lines (hf phase shift above, lf below) over Anacon Leadridge are ⅛ mile apart. Asterisk represents ore zone. Other conductors are weighted according to the ratio of low frequency to high frequency phase shifts and a diagnostic response in the low frequency. Previous and follow-up ground help determine nature of conductors.

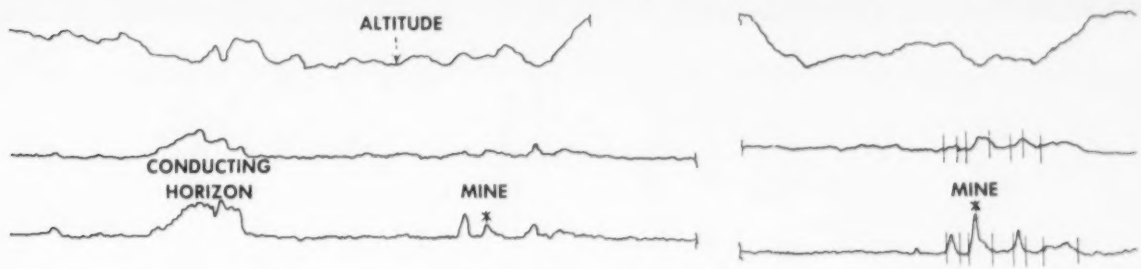


Fig. 5. Two flight lines 660 ft apart over Brunswick orebody (asterisk). Conductor at lift is sedimentary horizon striking at right angle to the flight line. The conductor shown near the mine is the contact between two formations. These lines show need for interpreter to be familiar with geology of the area surveyed and the value of having a trained observer with the flight to change flight plans (closer flight lines in this case) when conditions demand it.

Fig. 6. Response of known sulphide orebody under a lake is shown by these flight lines. Usually lakes show ratios (low frequency phase shift to high frequency phase shift) of from 0.25 to 0.4. This one went higher suggesting sulphides.

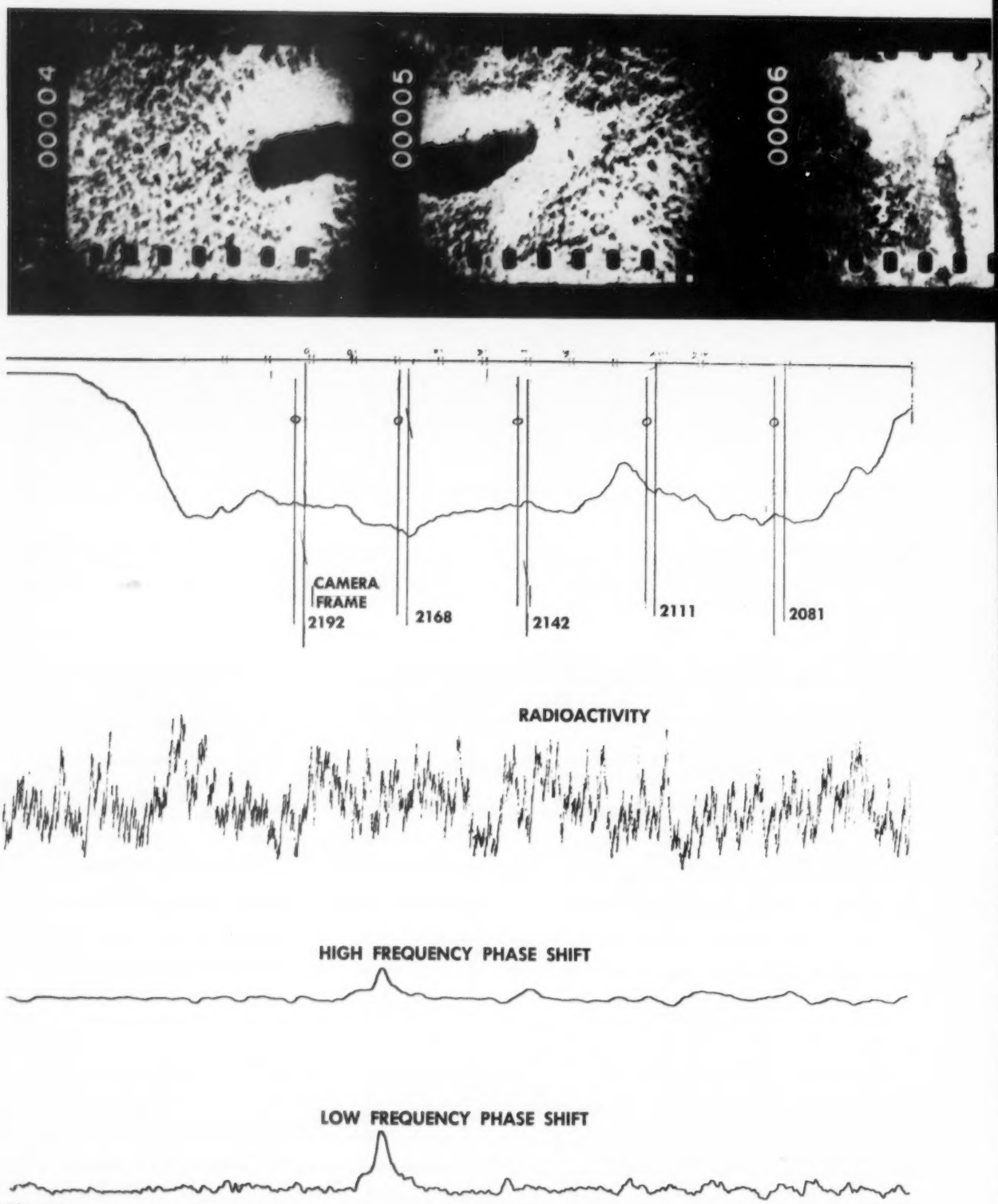


Fig. 8. Here is how geophysical surveys are coordinated. Vertical double strokes record camera frame numbers of 35mm films to position anomalies on the ground. Uppermost line is radio altimeter recording showing height of aircraft above the ground at all times so that its effect can be interpreted. The jagged line is the radioactivity profile in counts per minute. The scale can be varied to suit conditions. Lowest two lines are high and low frequency profiles of phase shift between transmitted and resultant fields. Combination of all results multiplies survey effectiveness.

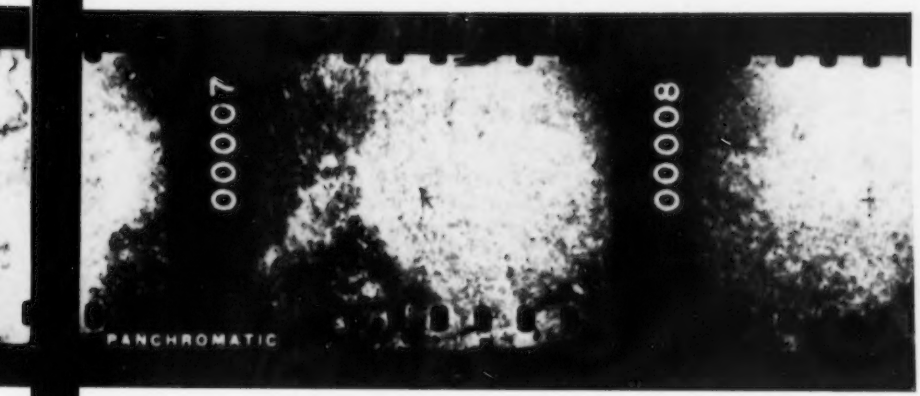


Fig. 7. 35mm strip film like this shows position of geophysical anomalies.

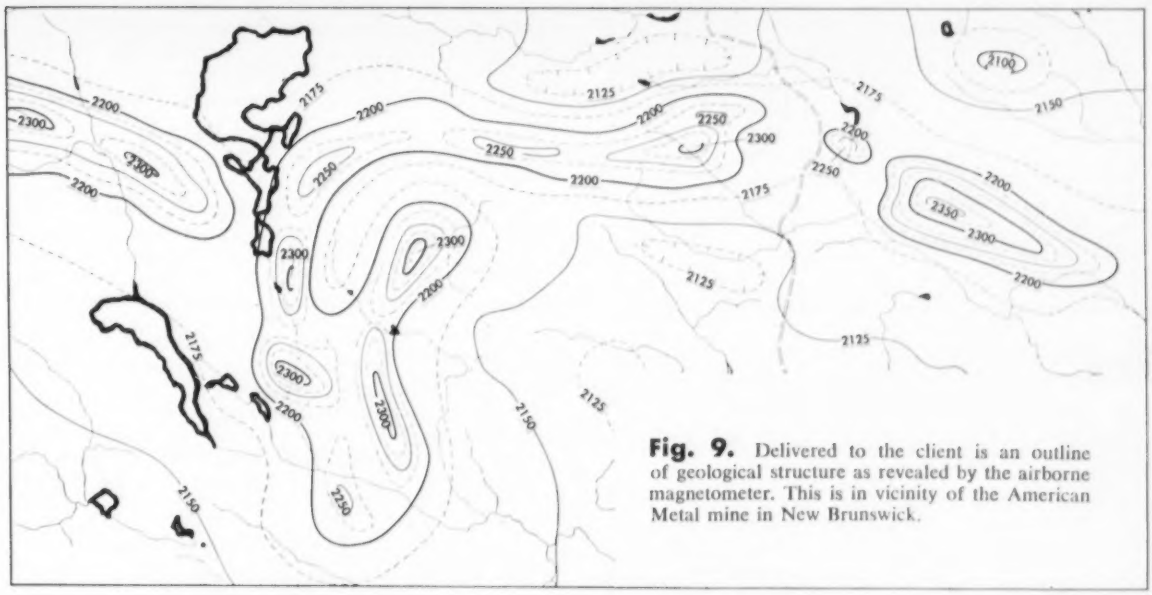


Fig. 9. Delivered to the client is an outline of geological structure as revealed by the airborne magnetometer. This is in vicinity of the American Metal mine in New Brunswick.

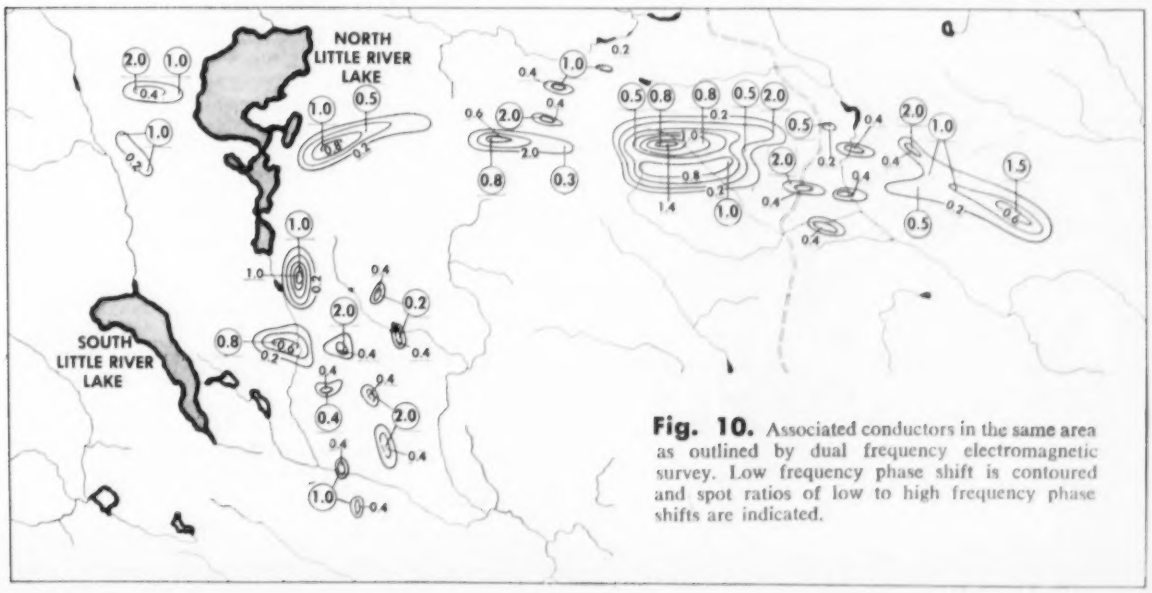


Fig. 10. Associated conductors in the same area as outlined by dual frequency electromagnetic survey. Low frequency phase shift is contoured and spot ratios of low to high frequency phase shifts are indicated.

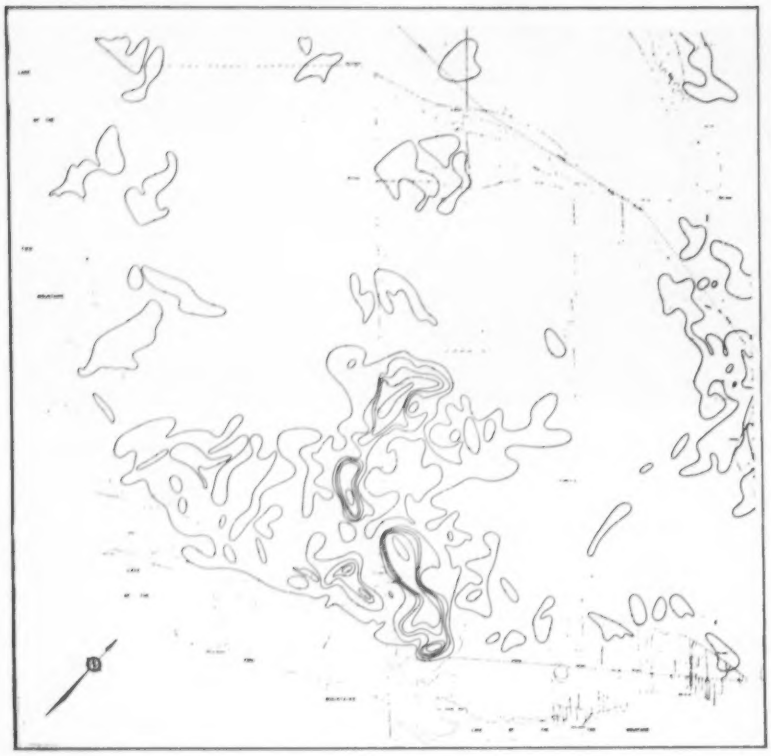
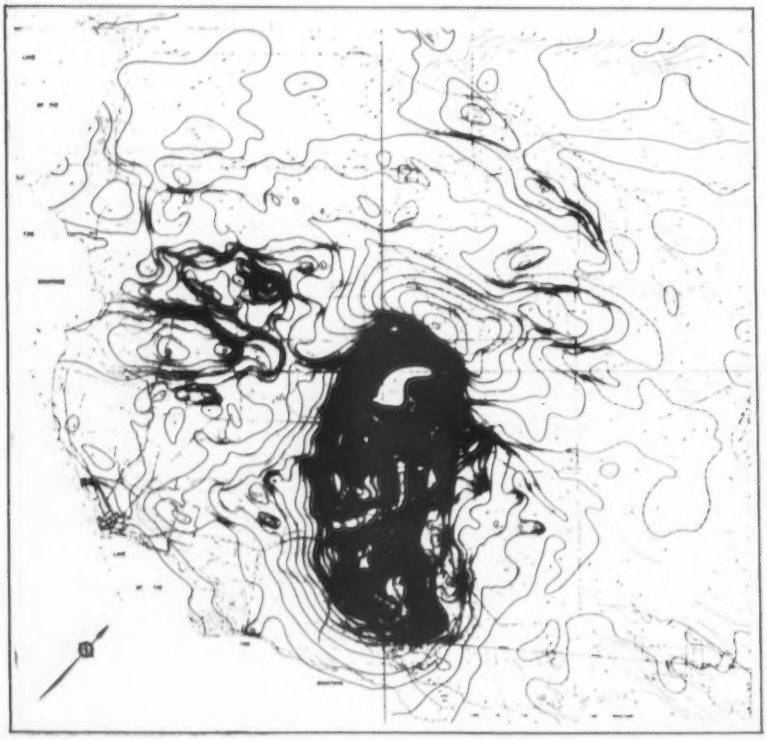


Fig. 11. In the Oka area of Quebec correlation between magnetic (below) and radioactivity (above) surveys was extremely helpful. Ore is recrystallization of magnetic minerals in highly metamorphosed limestones.



hole data. It may even be possible to determine soil types, structure and preferential tree growth from aerial photographs. Sometimes preliminary work should be undertaken by a ground party. All these add up to more effective interpretation.

3. Flight line direction is chosen to obtain maximum response from type of conductors that may be encountered. Ordinarily, flight lines should be perpendicular to the strike of the formation. In folded areas a radial flight pattern is sometimes recommended. Distance between flight lines depends on targets.

4. If possible a trained EM interpreter should accompany the flight. His on-the-spot evaluation of results, while not quantitative, can still be used to change flight plans for increased effectiveness.

Frequently results of the EM survey carry more significance when combined with the results of radiometric and/or magnetometer surveys. The flying laboratory permits the prospector to approach his objective from more than one side. Here is what he receives for his exploration dollar:

1. Strip film from 35 mm camera showing area traversed with frame numbers synchronized with geophysical profiles (See Fig. 7).

2. Geophysical profile including altitude of the aircraft at all times. (See Fig. 8).

3. Complete log of flight.

4. Final maps with:

(a) contouring of magnetic anomalies (Fig. 9);

(b) contouring of low frequency EM with spot ratios of the low frequency phase shift to high frequency phase shift (Fig. 10);

(c) map showing anomalous radioactivity (Fig. 11).

5. Statistical report of results with the physical properties of the instruments used.

Cost of this service in Canada comes to about $15 per recorded line mile. It's estimated that a ground EM survey alone would be about $125 per line mile. Charges for a complete interpretation of the airborne survey are not included in the $15. The contractor will usually do this for a consultant fee if the client wishes it.

Biggest saving for the alert exploration company is time. A 10,000 line

mile survey takes about 5 weeks of flying time, allowing for bad weather and other unfavorable conditions. Under ideal conditions 1,500 line miles a day has been surveyed. A worksheet for the client can be available from 4 to 6 weeks after flying is completed. With a steadily increasing premium on speed, airborne geophysical prospecting is destined for a bigger and bigger role in the modern mining company's exploration plans.

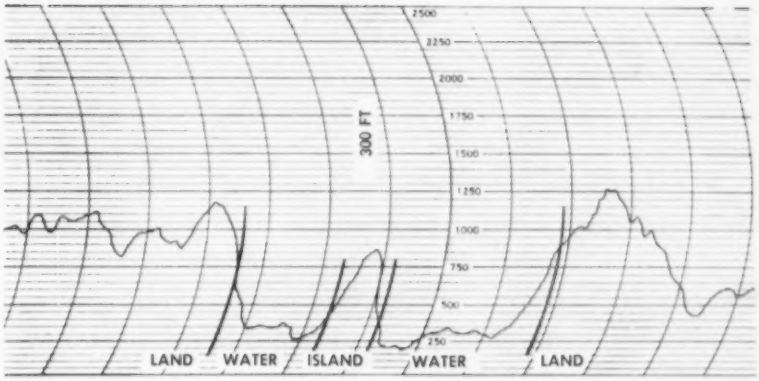


Fig. 12. This is how radioactivity readings vary over land and water. ➔

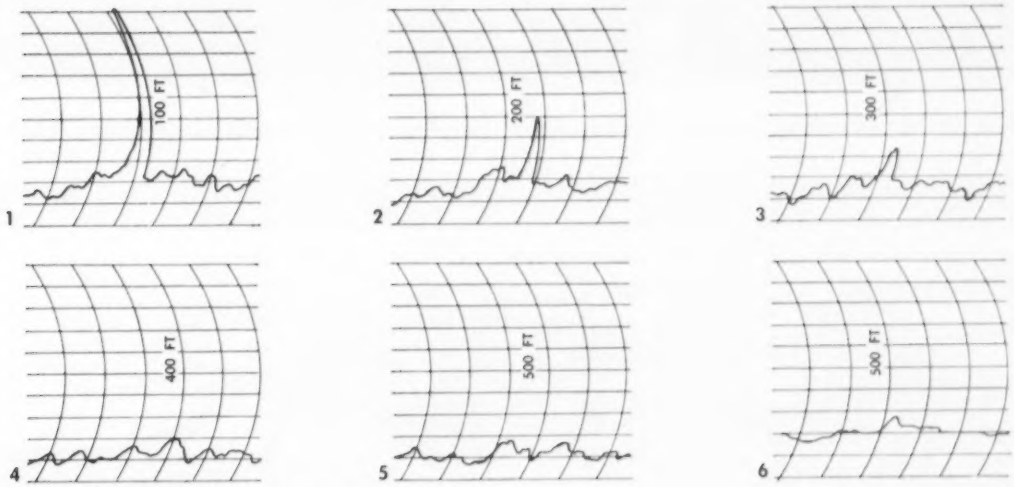
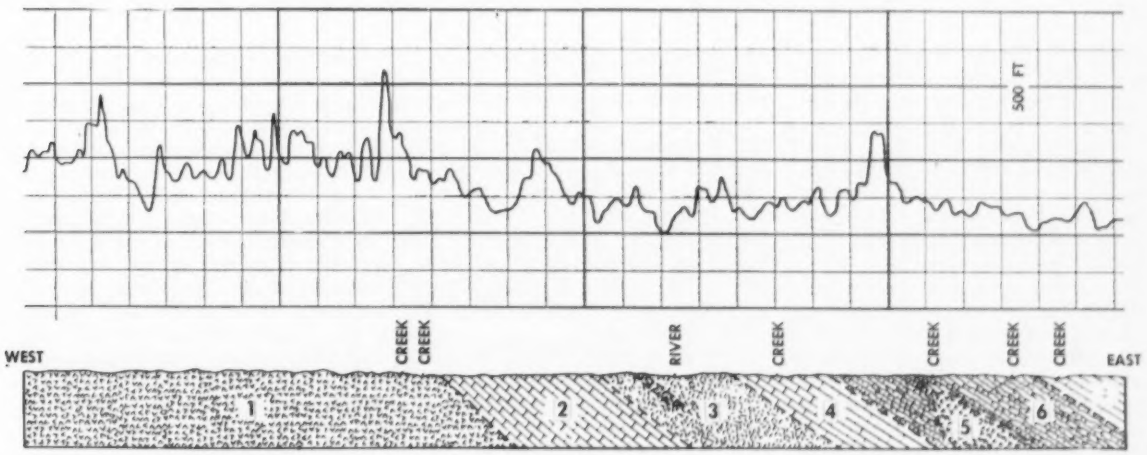
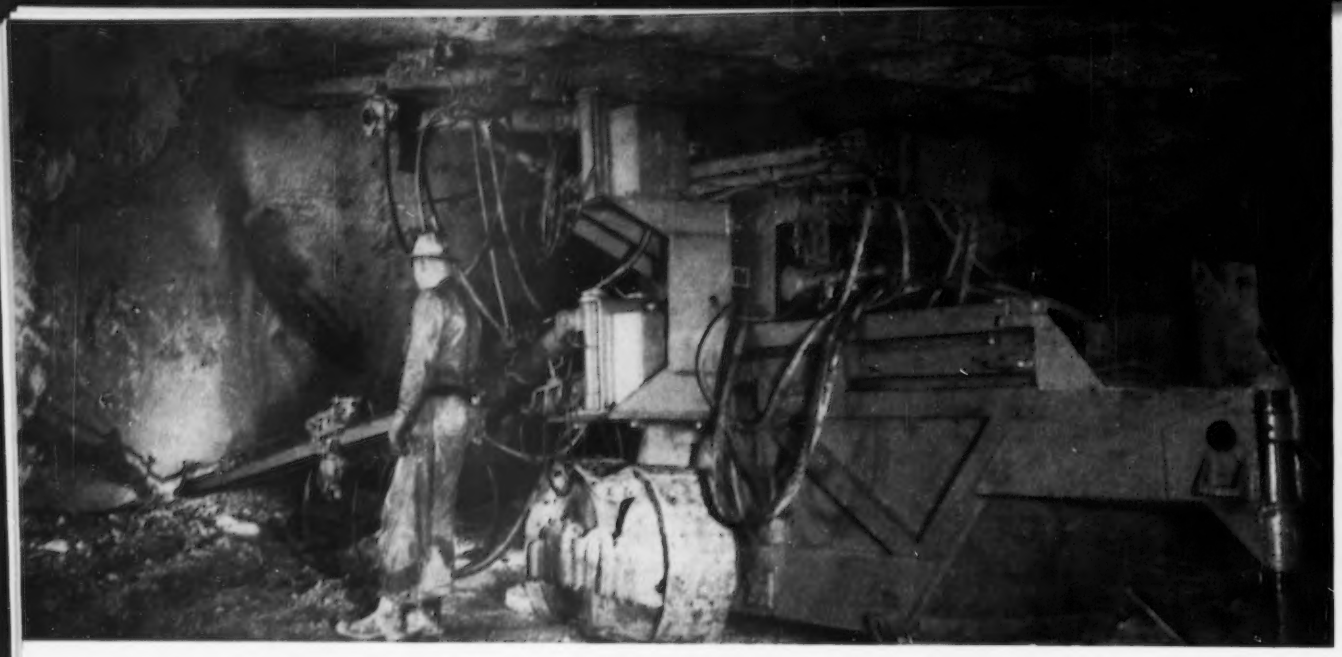


Fig. 13. These figures show how radioactivity readings vary with altitude from 100 to 500 ft. At 500 ft, integrating time of the scintillation counter was changed from 1 second to 1.5 seconds to make the reading more diagnostic. Point source of radioactivity was a "bomb" supplied by AEC placed on airport runway.

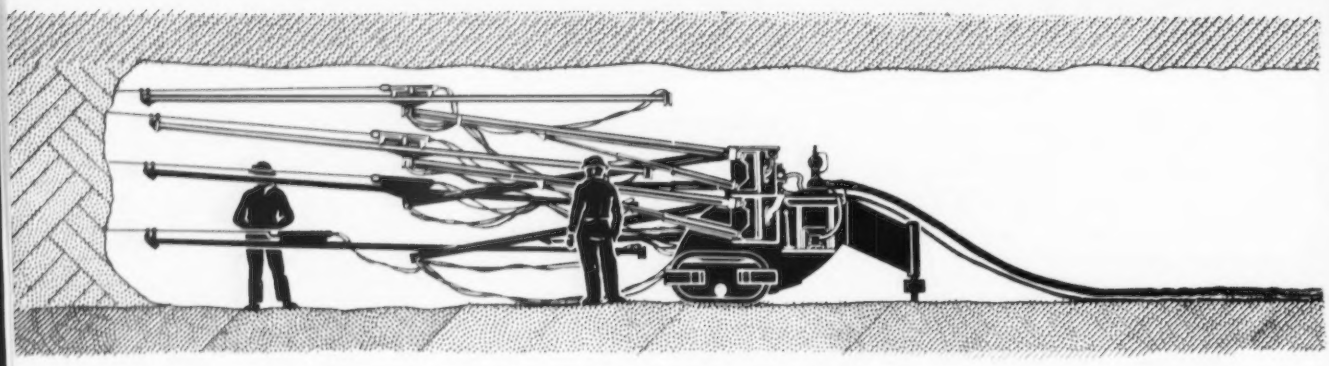


1 FAIRLY MASSIVE GRANITE; SOME LIMESTONE AND AMPHIBOLITE INCLUSIONS
2 CRYSTALLINE LIMESTONE
3 ALKALI SYENITE
4 IMPURE CRYSTALLINE LIMESTONE
5 GNEISSIC GRANITE WITH AMPHIBOLITE INCLUSIONS
6 PARAGNEISS AMPHIBOLITE

Fig. 14. Need of careful interpretation of radioactivity surveys is illustrated by this chart showing variation in radioactivity over different geological horizons encountered in an actual survey made recently.



Versatile drilling-loading-haulage features of the Gismo are increased by a new ramp at



New Jumbo Carloading Combine Speeds

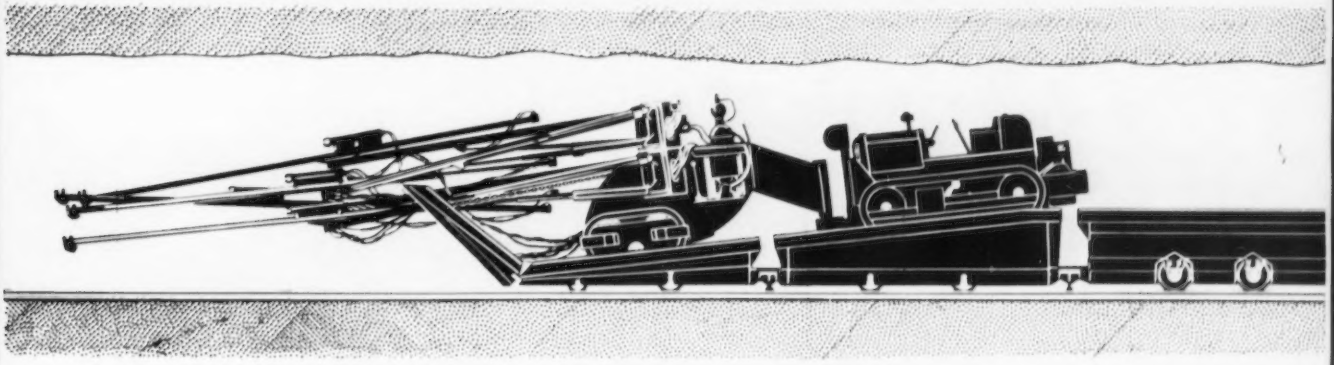
THE GISMO, which was first developed as a self-loading, cost-cutting transport unit at American Zinc Co.'s Grandview mine near Metaline Falls, Wash., is more versatile than ever. A full string of mine cars now can be ramp-loaded in sequence, thus expanding the unit's earlier function of speeding the drilling-mucking-loading cycle. (*E&MJ*, May, 1954).

The initial equipment designed for this job has been in operation since January 1955. Work completed to date includes establishment of a shaft station at the bottom of a newly-extended shaft and a portion of a long haulageway driven on the new 500 level. The shaft station is about 26 ft wide, 520 ft long and 12 ft high, with the shaft cutting the station 250 ft from one end. The haulage level has been extended 1,300 ft from one end of the station in the form of an 11x11-ft cross-sectional opening above the rail head. Part of the haulage tunnel and the entire shaft station were excavated by the Gismo unit and Gismo drilling jumbo on a trackless basis 260 ft in one direction from the shaft and 600 ft in the other direction. A 48-in. gage rail haulage system was then installed to within 100 ft of the haulage heading in progress, and the use of the Gismo development system was converted from an all-trackless to a trackless-Gismo operation combined with rail car haulage.

Over-all accomplishments of both systems have been remarkable. Basic reason for this is the small number of men used and high rate of progress per shift or per man employed. The normal crew per shift, exclusive of those used to extend rails, blower pipe, air pipe, water pipe, trolley wire and maintenance, is three men—one working boss and two miners. Height of the haulageway now being driven is 11 ft above the rail head, and width in the clear also 11 ft. No timbering or roof bolting is required. Average length of round pulled varies from 10 to 11½ ft and the depth of hole drilled is about 12½ ft. Tonnage produced in a round averages about 125 tons. Time required to muck out a round without track varies from 45 min to 2 hr, depending on hauling distance with one Gismo and one man. With the rail system involving transfer of broken rock to modified conventional mine cars and haulage to and dumping at shaft, time required is 1¼ to 2 hr, depending on the length of haul. When the track is extended every day after each two shifts of progress (currently about 30 ft or a rail length per two-shift calendar day), mucking time averages 1½ hr.

Recently, the haulage tunnel has been branched into two headings, and the work has been reorganized for

railhead which permits removal of jumbo after drilling of round has been completed.



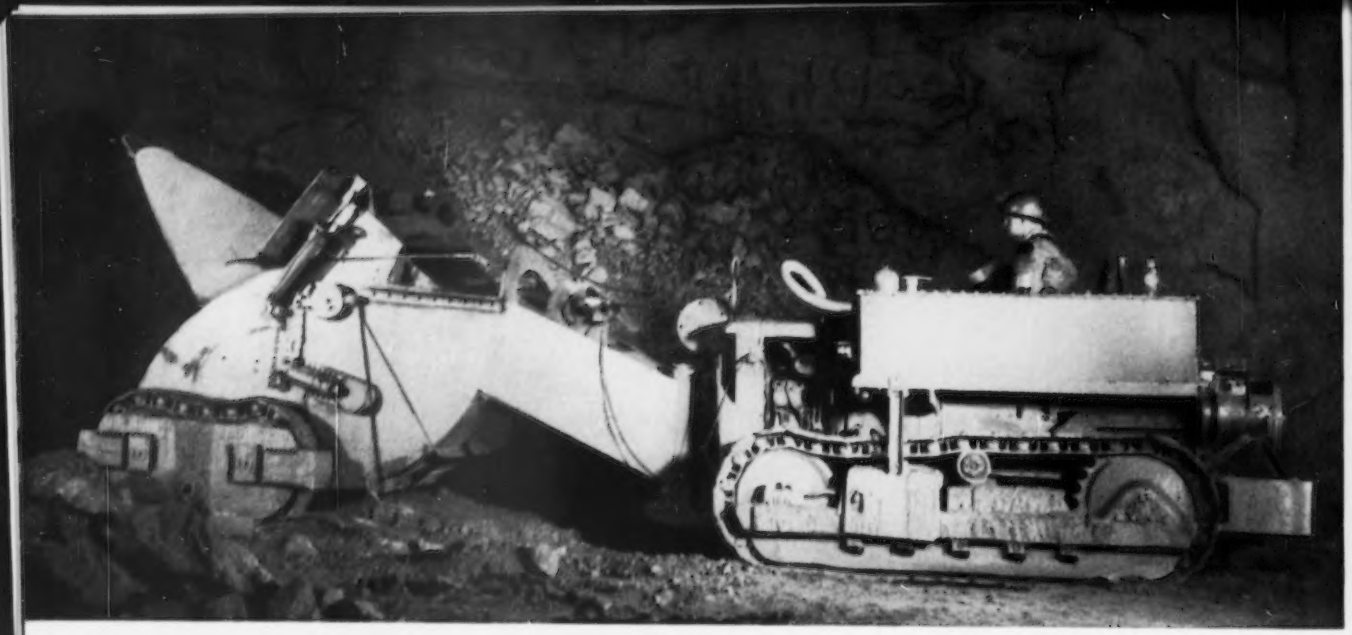
Development and Tunnel Work

driving on a two-heading basis. The crew, including the working boss, has been increased from 3 to 4 men. Progress, when operating on this basis with a single crew and two pieces of equipment—namely, one Gismo self-loading transport, one Gismo drilling jumbo and a modified diesel crawler tractor to operate both machines—has been a round in each heading per shift or 40 to 44 ft per two-shift calendar day with a total crew of 4 men for each two shifts. Under these conditions, the cycle is limited by the time required to drill out, blast and remove the smoke from either heading. Time required for this purpose is 3 to 3½ hr, or more than twice as much as is needed for mucking out a round. Mucking is done in one heading while drilling goes on in the other. After a drilled-out round is blasted, the mucking or drilling operations are interchanged in the headings.

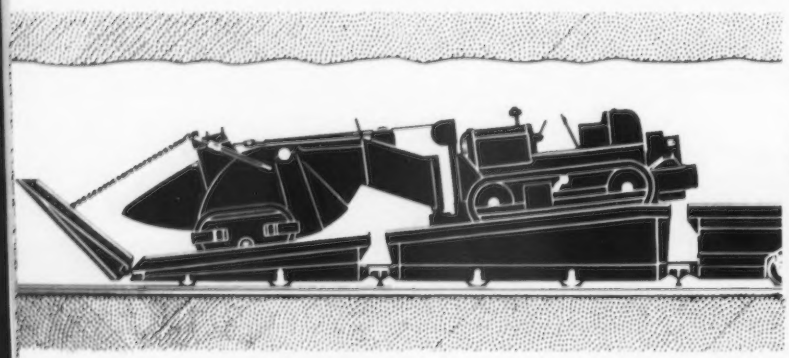
Average time required to drill out a round, with a 4-drill jumbo operated by two men and consisting of about 40 holes, varies from 1¼ to 2 hr. Holes are drilled to a depth of 12½ ft. Time includes moving the drilling jumbo in and out of the heading. Average time for loading explosives and detonating the round is about 45 min, and that for clearing the smoke out of the heading so that the Gismo is at the face ready for work is 20 min.

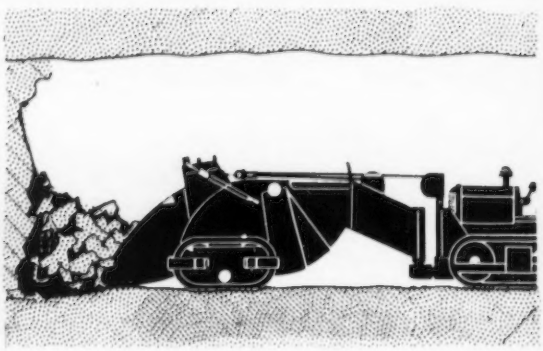
While the system used in development work by the trackless method is much the same as it has been in stoping operation development for several years, the method of transferring broken rock from the short trackless operation at the heading to the cars (usually less than 100 ft) is entirely new. The Gismo mounts a train of cars and fills each successively. The train is then moved out and replaced by another one. Sometimes the train is long enough to handle the entire round of 125 tons or more.

The Gismo used for this purpose is a recently-developed model, known as G-46. It has a maximum swing height of a little less than 7½ ft. It is designed for stope excavation, development work, and other similar tasks. Cars are of the low bottom-dump type for 36-in. gage track or wider, and of sufficient width and length to meet the unit capacity required. At the Grandview mine they are utility cars. They are modified to serve for production operations, or for development work by addition of simple structure along the inside of their side walls to provide a runway with a flange for the crawler tracks of the tractor and the Gismo. Folding stools and spacer bars are added between the cars when used for development operations. Access to the top of the cars is afforded by a car wheel-mounted incline ramp in



Loading unit is then pushed down ramp to face. Gismo now picks up load, ascends ramp at





two 16-ft sections. The 11% incline thus provided makes it easy for the Gismo equipment to mount the string of cars and load the entire length of the train with broken material.

Flanges on the runway of the cars are gaged a few inches wider than the outside width of the crawler tracks, thereby retaining the equipment in alinement on the runway by the same method that a flanged car wheel keeps mine cars on the track. Flange gage is wide enough to allow the Gismo to pass over cars when they are parked on a rail curve of 50-ft radius or more. Capacity of cars used in the Grandview mine is about 1½ Gismo loads. Runways do not join between the cars, and there is enough clearance for the cars to act normally around curves and through switches. Openings between cars are spanned by the crawler tracks. The car train, including the 32-ft incline ramp, is anchored to the track with a hook attached near the rail head. This prevents train movement and absorbs momentum if the Gismo unit is stopped suddenly while moving in either direction.

The Gismo assembly is heavy equipment. The tractor attached to the Gismo loaded weighs about 44,000 lb. This is distributed over 26 ft and supported on 108 in. of crawler track on each side—a heavy weight for the conventional mine car to support. Thus some car modifications were indicated. The runway structure along the side walls of the car is made of one sheet of flanged ⅜-in. plate. When installed each side of the car becomes a stiff box girder of great beam capacity. Cars are of the 4-wheel type, with wheel-bearing supports spring-mounted against the body and the frame of the car. Swing stools, put into operation quickly between the car when used for development, support the ends of the cars against the rail with a clearance of ⅜- to ½-in. from the rail head when the car is empty and the springs are not deflected by the Gismo weight. When the car is loaded, or the Gismo equipment passes over it, the springs are deflected. Except for the weight required to deflect the springs, the load is transferred to the stools on the ends of the cars and the side wall of the car becomes a sort of bridge girder supporting the weight of equipment running over the car. This method of support limits the load that can be put on the wheels, axles and bearings to the deflection capacity of the springs. The incline ramp wheels and the axles are rigid, not spring mounted.

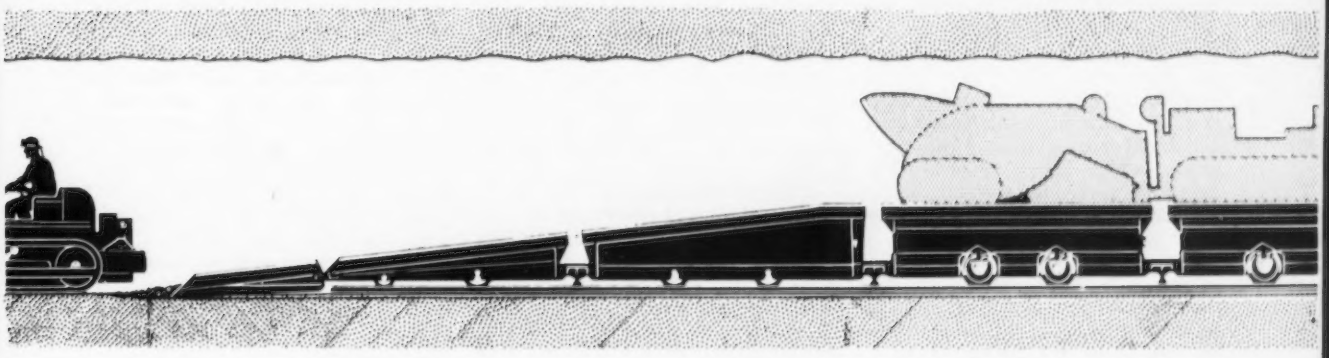
Work Cycle

Here is a typical work cycle:

1. Removal of gases by suction through a 22-in. tube, with intake less than 100 ft from headings. Time required—about 20 min.

2. The Gismo already has been loaded onto the incline ramp low-boy on the forward end of the string of cars at the shaft station. It is pushed to the rail head where the Gismo travels down the incline ramp and starts mucking operations. One man shores up the incline ramp and the first two cars towards the heading. Then all cars are shored up beginning with the last one towards the heading. Then two or three loads from the Gismo are dumped into the first car

railhead and drops load into cars. Whole train of cars is loaded in sequence by this method.



or two. After all cars have been shored up, the Gismo starts loading from the rear car forward. By the time the trip is loaded out, all of the shoring and stools have been removed between the cars from rear to the front end.

The trip is uncoupled from the incline ramp and exchanged for some empties. This is continued until the round has been loaded out. Then the Gismo equipment is again spotted on the incline ramp low-boy and taken out of the heading on the rails to a transfer point where it is taken off. The tractor is then detached from the Gismo transport and attached to the Gismo drill jumbo and loaded onto the incline ramp.

3. The incline ramp with the loaded drill jumbo is taken to the heading where the tractor pushes the jumbo onto the ground in the trackless area. It is then moved into position and drilling starts. The incline ramp is left in place for reloading the jumbo.

4. The drilled-out round is loaded with explosives, connected up and detonated. This completes the cycle.

Excavating rock by the Gismo method in drift, tunnel and other lateral mine openings without rail is very efficient for limited distances of progress. For a small drift, say from 8x8-ft to 12x12-ft, one Gismo transport and one drill jumbo would be used, possibly up to 1,000 to 1,200 ft. If longer distances are involved, several transports could be used with passing points provided. For a long drive, normal procedure would be to operate 500 ft trackless and then install rails, operating trackless only from the rail head.

The rail head need not be kept to the maximum distance of 100 ft. Maximum speed can be attained by moving the rail head forward the moment conditions permit installation of a rail length. For large cross-sectional headings, multiple machines could be operated simultaneously. For instance, two units, side by side, could operate easily in a tunnel heading 15 ft wide. Three machines could operate side by side in a 24-ft tunnel heading. In extra wide headings double track and double strings of cars could be used with enough Gismos so that the moment one loaded unit moved out of the heading another would move in to take its place. Such procedure would result in removing a large tonnage in a fraction of the time required when using conventional equipment.

Control of the grade line in the trackless part of the tunnel or drift is relatively easy because the Gismo establishes and maintains a smooth roadway in the trackless area covered.

The Gismo-car loading combination was developed to provide a fast and efficient and cheap method of loading cars where space limitations were such that over-the-end ramping was necessary. Cars other than bottom-dump types can be used provided they are low and have stability against tipping. The Grandview equipment cannot be operated for rail haulage where overall height above the rail head is less than 10½ ft. However a smaller machine, to be operated either by diesel or electric power, is under development for small headings, possibly with a limit in head room of not less than 6½ ft from the rail head. On a trackless basis this unit would work in a 7½x7½-ft heading.

Mining Practice—Part II

LLOYD E. ANTONIDES, Assistant Editor

Part I, in February, covered Underground Development and Stoping. Part II covers the Underground Mining process from there on. Surface Mining is covered in the last several sections.

ORE HANDLING

LOADING has not been commented on by many companies in our survey. There might be some slight trends indicated toward more scraping—less grizzlies—and more scraping directly into cars—eliminating chutes. Principal reasons given for changing to slushing are increased rate of production and reduced development work and dead height. Two comments about making a better chute design to eliminate bulk, installation work and maintenance, show interest but no definite results.

Some comments on loading in development work were given in Part I.

In open stope trackless mining, one statement was made that dipper shovels give lowest loading cost if headroom is high enough. For lower headroom, the scoop or straightline boom shovel is encouraged by manufacturers. And in low headroom the tractor-loaders, either overcast or front-end are frequently mentioned, especially in uranium. Dominion Wabana's iron mine has added another Joy gathering arm-type loader and a new Canadian salt mine has them.

In stope mucking to raises at Standard Uranium, a heavier tractor on a Gismo self-loading short-haul transport "proved a great advantage."

At Allied Chemical & Dye's Gossan Mines, a ½-yd electric shovel is used to load large Granby-type cars. And an Eimco 630 RockerShovel is used to clean up and to load rocker side-dump cars.

Mucking from floor of stope or level into cars is done at New Mexico Consolidated with Gardner-Denver overcast machines. Reason given: Ore is hard and blocky making use of chutes troublesome.

Scraping directly into cars from scrams at level of haulage back has been adopted by a company in Tennessee. The concreted loading point is closely sized to car to reduce spill. Cars are spotted with a remote control hoist by scraper operator so trip can be loaded while locomotive is released for other work.

A California mine likes remote control slushing from the side. They say it's more efficient as well as safer. A Quebec asbestos mine claims the device gives operator better view of car.

Other observations on scraping are offered, most are from sublevel and block caving mines: There is debate on folding versus rigid scrapers in some districts. The tandem-drum scraper hoist is mentioned as reducing size of opening at one mine. Various special patterns of rails in scram floor are claimed advantageous and at Johnson's Co.'s asbestos mine they feel no rails are necessary—it's cheaper to repour. Concrete support in scram is strong and has no projections but yieldable steel arches are finding application where rigid support does not hold up.

Chutes at Inco have been widened to give better loading of the new larger cars.

Transporting highlight is the further acceptance of diesel locomotives for rail haulage where ventilation is sufficient. Improved exhaust scrubbers have no doubt helped the acceptance. Combined Metal Reduction voices the principal application: to replace battery locomotives. But another company uses an 8-ton diesel pulling 50-ton trips on an average haul of 5,000 ft. They say it's good on long hauls, eliminates trolley wire troubles, and has low initial cost. Calumet & Hecla ordered diesels to replace battery motors where battery capacity was exceeded during shift. Triumph Mining Co. finds both their 7-ton and 3-ton units "very satisfactory." Goodman Mfg. Co. recently announced a 2-ton model and Universal Dredge Mfg. Co., a 1-ton trammer.

On the other hand, when their battery-motor hauls became too long, an iron mining company in New York State took the "regulation" step and converted to trolley-locos.

Larger cars are a trend too. For instance Inco has doubled the size of their Granby's from 56- to 110-cu ft. They also adopted larger locos—new 600 amp-hr, old 375. One new train of 8 to 10 cars equals the load of two old trips. As a result, the fewer haulage units make a more efficient operation.

Some other aspects of rail haulage are covered in replies from the iron mining country. Inland Steel does all track cleaning mechanically now. And M. A. Hanna has increased efficiency of cleaning and cutting ditches with an electric powered, hydraulic operated back hoe. It has an 8-ft boom, a 12-in. wide bucket and is mounted on a mine car chassis. Waste is dumped in center of track and loaded into cars with a Canton track cleaner. Cleveland-Cliffs uses a remote control on their locomotives at the camel-back dump. It ends danger to motormen if cars overturn and carry locomotive along.

A comment on rail haulage picked up from the section on Development in Part I has application elsewhere if track haulage is used. It's Sanford-Day's Gismo "piggyback" system, where, in dumping, the self-loading crawler-mounted transport rides up wheeled ramps and over a string of low-slung, bottom-dump cars. Cars have treadways on each lip. Utex uses it at the Mi Vida mine. Another gathering scheme some mines like is the use of shuttle cars.

Conveyor belt hauling has been recently adopted by several more properties—and not all large producers. Warner Co.'s limestone mine and Minerva Oil Co.'s fluorspar mine use it underground. Nevada-Massachusetts uses a 1,600-ft one to replace truck haul from crusher to mill. A borax mine reports "all belt conveyors." Duval Sulphur & Potash Co., potash division, is supplementing their main belt haul with panel belts to cut down shuttle car haul. They find them especially useful on steeper grades.

For longer conveyor systems the British seem to be concentrating on belts supported and moved by wire

ropes. The Germans apparently prefer chain for the pulling means, coupled with steel plates as carrying surface. One of the German designs, the folded belt conveyor, is capable of a spiral lift. In the U. S., belts containing wire rope are offered. Goodman Mfg. Co. has introduced a belt system using chain-linked idlers hung between two wire ropes. The scheme reduces the number of supports thus giving advantages in uneven ground, in crossing obstacles and in time for installation. It has more "give" too.

A unique aerial tramway hauling directly from underground, up a 4900-ft, 22-deg incline and overland for 1¼ miles, was mentioned earlier.

In trackless mining, Ozark-Mahoning mentions use of a Ford diesel trucks and tractor-trailer units. Most mines are well satisfied with 6-yd Koehring Dumptors. There also were remarks about shuttle cars proving very satisfactory. Their high capacity and ability to help load themselves were cited. A new salt mine in Canada adopted 18-ton rear dump LeTourneau-Westinghouse units in which cables pull rear wheels forward to dump.

The many reports about improved communications and control of haulage systems must be regarded as a continuing development in practice. A large Canadian base metal mine using rail haulage has adopted trolley phones, central dispatcher and electric switches. Gains cited are reduction in delays, maintenance and accidents. Traffic control signals are commonly reported from trackless properties too.

Hydraulic transport — pumping — has been apparently discounted for now on mine-run ore. Only one special case—a gilsonite property—is reported using it. They use high pressure water jet to break the ore, then move the ore as a slurry to surface. Of course, highly successful hydraulic transport of mill-tailings-fill was already mentioned under Ground Support.

HOISTING & PUMPING

Hoisting is keeping pace with higher rates of production by installation of bottom-dump skips of light metal (in vertical shafts) and automatic controls as well as larger equipment. For man-hoists, improved communications is the highlight in today's industry.

The debate of friction hoists against drum hoists proves one thing—neither is the answer to all problems. Evaluation of each factor must be made for the particular operation involved. And often exact mathematical solution is impossible. For instance the safety factor of multiple ropes may be important. On the other hand the fact that loads are frequently greatly unbalanced may be the important criterion.

On skip design, Golden Manitou likes their 5-ton bottom dump better than the former Kimberley type because there is less maintenance on both skip and dump, it cleans better and it gives a faster cycle. Shattuck Denn uses Jeto bottom-dump skips at the Iron King. And at least one Quebec asbestos mine uses aluminum skips.

International Minerals & Chemical Co. is very pleased with their automatic hoisting. Several other properties join in the acclaim for "automation."

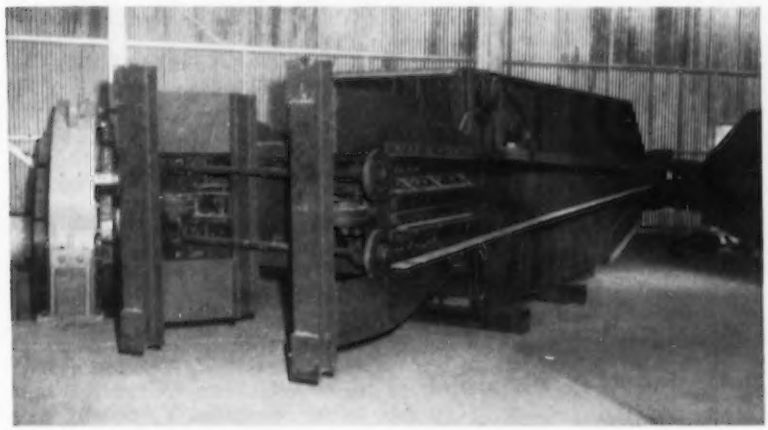
A friction hoist is being installed at an iron mine in Canada for automatic hoisting of service cage in balance with a 6-ton skip for development waste. Cleveland-Cliffs has put two into production use at Cliffs-Shaft Mine "C."

At San Manuel, the new dual double-drum hoist installation will hoist one of the world's largest tonnages—36,000 tons in a 20-hr period. The two 3,000-hp dc motors are 1,000 hp larger than those at Anaconda's Kelley Shaft hoist in Butte, reputed to be the world's largest in 1952. This new hoist is semi-automatic—push button control by operators at loading-pocket and headframe-dump. Eighteen-ton bottom-dump skips in balance are used. Maximum rope speed of 3,000 fpm is designed for years ahead when mining goes deeper. Rope is 2¼-in. diameter.

New radio on the cage is reported by Gossan Mines of Allied Chemical & Dye. Alcoa Fluorspar Div.'s electronic installation is not yet completed but one is in use in a 52-deg inclined shaft in New Jersey.

Hoist cable is now available with insulated wire conductors in the core. A slip ring on the hoist completes the wire circuit for telephone. System is used in at least one mine. It is especially advantageous where radio means are troublesome.

Materials handling is often related to hoisting because that is usually the critical point. Madsen Red Lake cuts time required for handling mine timber 60% by using a special skip lowered under the cage. Loaded on surface, it is designed so it can be put



HOISTING cycles are faster in vertical shafts with bottom-dump skips. This is one of four 18-tonners used at San Manuel.

right on the track and trammed directly to working place. On return trip it carries scrap timber, drill steel, etc. Pioneer Gold has mechanized handling of underground supplies. And U. S. Smelting at Lark uses a fork lift and packaged timber to increase efficiency. The trend toward underground shops noted in the survey also takes the load of the hoisting system.

No new installations of conveyor belt hoisting, as at White Pine Copper and Pend Oreille, have been reported this year. And nothing has been reported on hydraulic hoisting other than at the gilsonite mine mentioned before.

Pumping is becoming more automatic. Inco, Calumet & Hecla, Inland Steel, M. A. Hanna and many others have adopted new schemes. At U. S. Smelting's U. S. and Lark mines, a supervisor's alarm system on the pumps completely eliminates the need for a pumpman. Inco has an indicator on surface. Calumet is centralizing their pumping.

Stainless steel casing and impellers are cutting corrosion at M. A. Hanna and International Nickel. Golden Manitou mentions that use of stainless steel pump discharge pipe and plastic drainpipe is their answer to acid water.

Several replies referring to use of vertical turbine pumps, deep well and submersible pumps show interest in the several types. Some confusion in terminology requires caution in discussing them. Horizontal or vertical arrangement is possible with almost any pump. In general, reciprocating pumps have declined in use and the single volute-type centrifugal—simple in construction, versatile in application—is most common. Multistage assemblies give fairly high heads. But greater depths and trend toward centralization are bringing the turbine-type (non-volute) centrifugal into the picture. It lends itself to higher heads, especially in multistage assemblies. But solids in water are an obstacle. By combining turbine and propeller (like ships screw) design, the solids problem is reduced and an axial flow characteristic permits smaller diameters. This aids their application to wells. Suction head limitation requires that a pump be near the sump. In deep wells, the pump unit is submerged. To eliminate the disadvantage of a long drive shaft in deeper wells, a long thin, sealed electric motor is close coupled below the pump to make a submersible motor-pump. Several variations of impellers, lubrication, etc., are used. It appears there is a trend toward this latter type of centrifugal pump.

POWER & SHOPS

Power considerations loom ever larger in mining. Our industry is not alone. As manpower per unit of production drops, other power requirements grow. Since the ultimate source of most industrial power is—and will be for some time—heat, our nuclear and fossil fuels branches have a bright future. But to the miner, power generation, distribution and transmission is an increasingly complex picture: more dieselization, more electric blasting, more hydraulic jumbos. Some revolutionary designs of mining equipment are evolving from ingenious use of various combinations of thermal, electric, fluid and mechanical power devices. Progressive managers will have to give fundamentals some serious thought to analyze the factors properly.

It is very difficult to confine the topic "power" to any limits. But here are a few comments received:

Pioneer Gold has their own 1,500kw hydroelectric plant. They also use a Pelton water wheel to compress air.

To bring in power for mine and mill, Idarado Mining Co., Ouray, Colo., runs a 5½ mile 12,000v line through underground workings rather than over the mountain.

Cleveland-Cliffs participated in construction of a new steam electric-generating plant in Marquette. Getting electricity to the new Gaspe mining region with an underwater cable is a major project.

Calumet & Hecla is replacing steam-driven air compressors with electric units. Distribution of air is by light weight spiral weld pipe.

White Pine uses much electrical equipment. Primary distribution is 13,800v; secondary 4,160v; and at the face, 440v. They use semi-portable substations underground.

At Sweden's Kiruna mine, decentralized air supply is the answer to losses in long lines. Each drill jumbo has its own compressor.

Diesel locomotives eliminate trolley wires and charging stations. With exhaust scrubbers of new design promoting more dieselization, perhaps we can expect less electrical distribution underground. Condenser discharge blasting machines also cut down the maze of circuits. But if powerlines must go underground drill holes are finding use as a conduit at several properties.

Manufacturers of equipment are intimately concerned with power. Joy's small hole rotary drill is driven by hydraulic fluid pumped by an electric motor. New long conveyors in use are designed to remove power transmission from the carrying surface and give it to a separate wire rope or chain. Many other developments in the power field will affect mining but one of those that manufacturers claim will have more immediate effect is the silicone insulations for electric motors. Its heat resistance and mechanical strength are a boon for rugged service.

Controls is a topic closely related to power and in turn to all other classifications of mining technology. Electronics is the guiding angel. While, according to our survey, hoisting and pumping have been the scene of most automation, there is an endless field here again.

Several manufacturers are promoting the use of television for observation and control underground as well as on surface. The low level of lighting is a restriction.

Shops and Maintenance are likewise wedded to power and mechanization. There is always a host of new equipment to make a job easier, quicker or better. They must be left to another type of survey. Our replies were more general.

There is a movement toward underground shops. Minerva Oil, International Minerals & Chemical and White Pine are among those that felt it is notable.

Several mentioned emphasis on preventive maintenance. For one, Calumet & Hecla is working towards preventive overhaul and uses a job-order system with equipment record cards.

Bit sharpening at the face had some popularity at one time but our sole reply on this was from Pioneer Gold. They have moved all their work from each level to a central shop. It gives better control.

The advent of more electronic equipment for control and communication means our electrical maintenance teams are in for enlargement or further education. Fortunately most of it is being designed for unit replacement.

COMMUNICATIONS, SAFETY, ETC.

Communications is a far reaching topic and advances have been stated in earlier sections of the survey report. To summarize, banging on the pipe is effective but the vocabularly is limited. Radio has severe limitations underground but now with the availability of sound-powered telephones, many mines are finding voice communication is simple and can give gains in efficiency. Ozark-Mahoning used them in shaft sinking between muckers and hoistman. Inland Steel uses them between stopemen and trammers.

Telephones are almost standard equipment on locomotives. M. A. Hanna likes their aid in emergencies. White Pine has one to each operating unit. A borax mine has one on each continuous miner. Two mines mention connecting an underground phone direct to a Bell system.

On the surface, a powerline carrier telephone circuit eliminates the need for separate line at an isolated Canadian mine.

In shafts the bell is still there but many have supplemented it with an electronic voice communication system. For the cage, radio is the obvious choice but where troublesome, hoist cable containing insulated wire in center is used for telephone.

In any system, getting the other party's attention is still a hurdle in spite of audible and visual devices.

Visual signals — lights or semaphones — were often mentioned for regulating haulage systems.

Safety is and must continue to be a prime consideration of mining companies. Our accident statistics still put us near the wrong end. Whether many of the mining hazards are inherent or not can lead to a long debate. But certainly concentrated efforts can reduce the accident rate of any category. The National Safety Council's 1955 campaign against falls-of-ground accidents will prove this without a doubt. Reports on the first 6 months gave an average 27% reduction in frequency. In connection with that hazard, International Minerals & Chemical and several other mines are using a micro-seismic detector to warn of unsafe ground.

Many mines report excellent gains in their safety record by having periodic meetings on company time. Alcoa Fluorspar, for one, improved their record 70% as a result of bimonthly underground meetings.

Inland Steel gives green hats to men with 5-yr safe work records.

Safety gets a boost at Union Carbide Nuclear Co., Bishop, Calif., where a 35mm camera is used underground to get actual photos of good and poor housekeeping, safe practice, etc., to show at monthly meetings.

Pioneer Gold has a safety bonus system as well as classes.

Canadian Johns-Manville has a custom-made poster and movie program for their bi-lingual situation. It's part of a very extensive safety and educational set-up.

Job hazards analysis itself seemed to have a beneficial effect at Hollinger even before any action was taken.

Looking ahead, noise abatement and ear protection are the conversation pieces of mine safety chiefs today —legal requirements are coming into the picture. And well they might, for noise in a heading is well above the proverbial boiler factory.

Color coding ran into limitations underground because of the dust and dirt. Whether improved lighting will run into a similar obstacle remains to be seen.

Ventilation and dust control often go hand-in-hand. In uranium mining minimum safe standards and tests have been established for radioactivity hazard. Gas and dust are the enemy and ventilation is the weapon used against them.

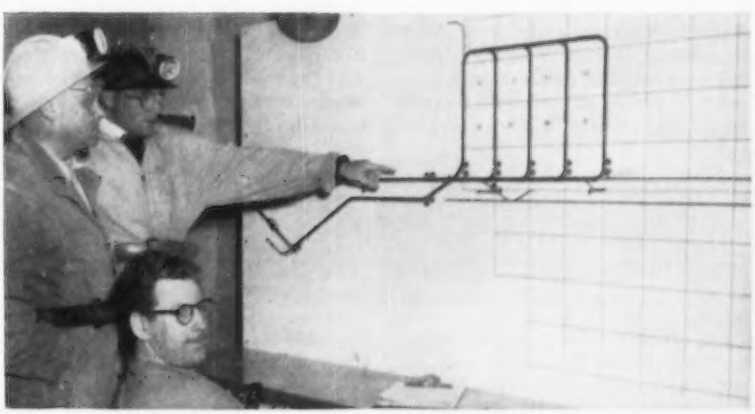
Drills, cutters and loaders generate considerable dust. Wet drilling and water spray on muck or loading mechanism is a stock solution. One mine mentioned a 2,000 cfm fan on each continuous miner. They also use plastic spray to seal brattice cloth.

In hot mines humidity control is the most important ventilation factor according to South African sources.

One correspondent felt that the need for fresh air and not just recirculated air has become better known. The many new surface fans and vent shafts are evidence — for example U. S. Smelting's fan at Lark is 125,000 cfm, Pioneer Gold's is 65,000.

Working conditions are being improved. Better eating facilities are typified at Minerva Oil where heat, light and washup facilities were installed in an underground dining room. Underground toilet facilities with sewage disposal by septic tank have proven themselves at two mines after several years use. In operation at Inco are 30-passenger, enclosed man-cars for longer hauls.

Labor relations highpoints given in the survey include: General training, as well as induction, program at Pioneer Gold. Bonus system at Combined Metal Reduction includes all underground employees. Change from column-mounted drifters to airleg was eased at Kerr-Addison by raising contract rate 15% then dropping back in 5% jumps over 4-month period. General relations improved at Sunshine Mining Co. when a supervisory training program was started. It also helped solution of operating problems and is good channel for information in general. Routine engineering jobs at American Chrome Co., Nye, Mont., are done by non-college men, releasing trained engineers for other work.



TROLLEY PHONES are helping central dispatchers to control haulage efficiently.

MINING soft material on surface is done by many means. Even hard rock pits find dredges strip overburden at low cost.

SURFACE MINING

Removing an overburden of loosely consolidated material, as well as actually mining such material as ore, is chiefly a task of loading and transporting. The lowest cost methods should be those in which these two functions can be combined in a single stage. The success of suction dredges in removing overburden from iron ore under Steep Rock Lake is well known. Now AS&R has adopted the method to remove overburden at their Lake Asbestos operation near Black Lake, Quebec. Obviously the dredge has a restricting requirement, water—abundant and readily contained. But contract costs for dredging are reported down around 10c per cu yd as against 50c for power shovel and truck.

Over the past several years Demerara Bauxite Co., British Guiana, was able to make a cost study of various methods used for stripping. The lowest cost (7.3c per cu yd) came with "free hydraulicing" where water was used to wash the overburden into open channels. Next, cost-wise, were pumping schemes (lead by a section dredge at 8.5c per cu yd), followed by a dragline (12c per cu yd), wheeled scrapers (26 to 38c) and finally dipper shovels with wagons (46c per cu yd).

It should be pointed out that the dragline has a more limited "transporting" distance than the others when considered by itself. The Florida phosphate properties generally pump the ore from the dragline dump to the mill. Others use vehicles or conveyors. But, of course a second step raises costs.

The size of operation also is a factor. Large units such as dredges and draglines lend themselves only to high rates of production—over 300 cu yd per hour per unit at Demerara, over a 1,000 in phosphate.

Another type of large stripping unit that is getting publicity this year is the bucket-wheel excavator. But its use has been confined to coal stripping. Dipper shovels in this same work are up to 60 cu yd in size now.

Several operators of smaller fluvial deposits report that their installations of slackline cableways with scraper buckets give low costs.

Breaking up loosely consolidated material is generally accomplished with the loading unit. But for wheeled scraper operation, one company says a rooter helps keep costs down.

DRILLING & BLASTING

For primary drilling in rock, testing of rotary vs churn drilling goes on. The story is always the same. As Bagdad Copper Corp. says, the rotary gives more footage per shift at lower unit cost. Steep Rock Iron Mines, Ltd., states their testing showed that rotary drilling is 3½ times as fast.

Even the hardest ground is now being tackled. A large rotary unit using a 9 in. tungsten carbide tri-cone bit has appeared on the tough rock scene of the iron ranges. In Michigan, Cleveland-Cliffs' Humboldt Mine reports tests. And from Minnesota, its use is reported. But it seems it is too early to give a complete picture of results. Joy Mfg. Co. makes the rig and it is reported Hughes Tool Co. makes the bit.

Jet-piercing rigs, pretty well established for most economic primary drilling of hard solid taconite, are giving even more successful results with a "chambering" technique. Linde Air Products says the resulting "flame-shaped" enlarged hole bottom permits more effective concentration of explosive.

The "sonic" oil well drills, under development, and the "down-the-hole" quarry drills, already on the market, were briefly mentioned in the earlier section on Underground Drilling. The "down-the-hole" drill tests show excellent results in demonstrations but no operators mention their use so far. Ingersoll-Rand's air operated unit can be used as a plain rotary as well as "down-the-hole." The latter is claimed to be faster, to be usable in harder rock, and to drill straighter in fractured rock.

Larger diameter (12¼-in. rotary) holes cut costs for Chino Mines Div. of Kennecott Copper. The gain in reduced footage per ton carried over to blasting. Loading time fell, and even fragmentation was reported better.

Lay out of drill hole patern by surveyors reduced drilling cost at National Lead's MacIntyre Mine.

For trimming faces and bottom in large pits and for primary drilling in small quarries, wagon drills using the new 4½-in. drifter-type percussion drills evoke compliments from many operators. For some, Gardner-Denver's Airtrac mounting is a boon in rough terrain. One mentions use of a Joy Challenger mounted on a truck for trimming permanent benches.

Secondary drilling is more efficiently done at several quarries using truck mounted telescopic booms which, in turn, mount a percussion drill. Some have platforms. Most are self-contained units. Wagon drills also do some of this work at various properties. In taconite, a small jet-piercer working off hoses from "mother" primary drill rig is new.

Secondary breaking costs with dropball at the MacIntyre Mine, already low, have been cut even further by reclaiming the ball. When 8,500-lb billet wears to an ineffective 5,500 lb, it is trimmed, one end is machine sur-

faced and then it is welded to another similar one.

But the real secret of low secondary breaking costs is better primary breaking in the original blast.

Primary blasting practice for hard rock as well as softer overburden is showing increased use of new, low-cost, insensitive blasting agents. Ammonium nitrate and carbon compounds are their basis. Although coal strip mines report widest adoption, several properties on the iron ranges as well as in the southwest, northwest and northeast are also using them. Akremite is a "make-it-yourself" agent. Others are offered as prepared agents by the various powder companies. Two cautions: they need special primers and are not very satisfactory in wet work. Plastic bags aid handling and Dupont's Nitramite is furnished in a water resistant container.

Millisecond Primacord connectors are mentioned by two copper pits and an asbestos pit as new practice. Usually they are used between rows.

DRILLING solid taconite, jet-piercer is cheapest, but rotary is being retested.

Bagdad Copper reports speedier placement of stemming by use of a Payloader.

The asbestos pits report use of a low-cost—but, of course, less rugged—detonating fuse called B'line made by Canadian Industries, Ltd.

Blasting research makes considerable use of photography. Atlas Powder Co.'s work on three dimensional and rapid sequence photos is notable. Bethlehem Steel records their blasts at the Bridgeport, Pa., limestone quarry on a seismograph tape and an aerial photo. It helps counter possible litigation.

A blasting technique of using small holes around a large hole to give better fragmentation was tossed around in one discussion. We would welcome more on this from any reader.

Likewise, loading adjacent holes with different velocity explosive to get better fragmentation was mentioned but as yet we have no report from an operating property using the scheme.

For secondary blasting (block-holing), Ensign-Bickford's Quarrycord and connectors are becoming popular. The combination is used to light safety fuse in multiple shots from one point.

ORE HANDLING

Ore handling in open pits is jumping to larger units again. Several mention new 6 cu yd shovels, two others mention 10 yd units.

Hand-in-hand with larger shovels come larger haulage units. In trucks for smaller pits the jump is from 15-ton to 22-ton dumps. The iron mine that put on the 6½-yd shovel matched it with a 34-tonner. But for real large units the trailer or wagon is the answer. As one reply said, remember "the old adage about pulling more than you can carry." The 50-ton size isn't uncommon now. Quarries are adapting the overhead hoist and side dumps. But the coal people out do us in size. They talk of 80- to 100-ton units.

Some place along the line flexibility of units — moving shovels, timing smooth flow of haulers, etc.—as well as mechanics will put a limit on size. But apparently production rate is the basic factor so far.

Good pit roads pay-off according to quite a few operators. One mentioned a concrete roadway, others asphalt topping, some just well maintained crushed stone.

Rail haulage apparently was static. One iron property mentioned new 40-cu yd air operated side dumps which gave only slight increase in tare over 30-yd cars. A copper pit mentioned loading railroad cars with trucks dumping from a ramp.

Inclined skip hoisting is in the news. Several new iron pits are using it. At M. A. Hanna's New Morton pit uneven track worries are eliminated by a three point suspension on the rock-over skip. The rear axle is centrally pivoted. Hoist is remotely operated from observation booth at top.

Conveyors are frequently mentioned in use without particular comment. Alpha Portland Cement in Catskill, N. Y., replaced an aerial tramway with a new belt to haul overland.

Several pits brought out the fact that their underground haulage is proving successful. Conveyor belts and trucks are used. International Nickel cut two truck tunnels to free a block of ore for mining from pit rather than underground.

MISCELLANY

Communications means radio for pits. More properties have installed them—some for just key personnel; others added them on their production units. As one says, "radio gives better control, speedier maintenance and less down time."

Automatic controls on pumping equipment were mentioned in replies from the iron country and the Florida phosphate field.

From a California property comes a reply on safety and health. All mobile equipment now has enclosed cabs that are insulated and heated, with tinted glass and air filters.

More time study work was reported from many properties.

Reclamation of pits may not have much urgency in remote areas. But in the Florida phosphate fields Davidson Chemical Co. has made it into a profitable operation. Some reclaimed land has been sold to housing developments. Of course, the coal strip mines lead the way toward countering poor public relations with reclamation and at a profit.

CMA'S EXECUTIVE V.P., Bob Palmer (right) confers with Oscar H. Johnson (left) board chairman of Idarado and Frank J. Maloit, New Jersey Zinc manager at Gilman, Colo.

THIS LITTLE DOLL, Jeannine Cook of Denver, is making herself at home in the door prize that was later won by E. H. Dill of Denver at the famous Sow Belly dinner.

INCOMING PRESIDENT of the CMA, Mike Cloonan (left), receives congratulations from Roy Burkett of Denver, Colo.

PRINCIPAL SPEAKER at the Sow Belly dinner was presidential assistant, Harold Stassen, seated here with Charles Steen.

AT URANIUM SESSION are (l to r) P. L. Merritt, New York, Mr. and Mrs. J. A. Tavelli and C. A. Rasor of Grand Junction.

FEMININE CONTINGENT from Grand Junction includes Mrs. S. P. Wimpfen, Mrs. A. M. Jones and Mrs. N. B. O'Rear.

Government Policy Problems Share CMA Program With Technology, Law

Uranium's 1962 question, protection for the domestic miner and practical help for the small mine operator pack 3-day convention agenda.

IT WAS FAR from all quiet on the western front when the Colorado Mining Association staged its National Western Mining Conference in Denver early in February. A record-breaking crowd of some 3500 was on hand as Government mineral policies were battered by rolling barrages. And even in the largely prosperous uranium segment there were a few lively skimishes.

Actually few industry get-togethers are as friendly as this annual conclave with its traditional Sow Belly dinner. And few have so much useful-down-to-earth information for the small miner and prospector on all phases of his business.

For example, the Tax Section, on the opening afternoon of the meeting, wasted no time in getting down to brass tacks. Particularly good was a checklist of elections and options generally available to mining companies to keep in mind when tax questions come up. The checklist was part of the paper, "Preventive Tax Planning" by Leonard S. Fox, a CPA of Denver, Colo. On the same program Walter E. Dalby, another CPA from Grand Junction, minced no words: ". . . . you're going to have to keep better books; the Government will require it." His basic discussion of handling of operational accounting problems was as practical as a cap lamp.

Excellent technical sessions were held on the first two mornings. One of the most informative papers was, "The Use of Cyclones in Industry," written by William Marston and presented by Jack Melin, both of Dorr-Oliver, Inc. The paper showed where cyclones fit among separation equipment, and how separation can be improved by using the cyclone with other units.

Government mineral policies were under attack from all sides for helping foreign mining industry to the detriment of the domestic miner. Sessions on mineral policy ran the gamut from the proverbial clarion call to action to the mere gnashing of teeth.

In tungsten: Blair Burwell, Minerals Engineering Co., deploring support of a Korean plant that requires 3,000 men to produce 600 tpd, said, "We're going to make a row."

In fluorspar: Jacob Blecheisen, president, Rosiclare Lead and Fluorspar Mining Co., Rosiclare, Ill., outlined the steps toward tariff relief ("Painful and without conclusive action") taken by the Independent Fluorspar Producers Association. In summary he pointed to the irony of a withering industry which supplies an important raw material to two booming industries, aluminum and steel.

Clyde L. Flynn Jr., attorney for the Independent Fluorspar Producers Association, also took a swing at the "free traders" in documenting inconsistencies in Government policy making. Lack of understanding, according to Mr. Flynn, is largely responsible for the deterioration of the fluorspar industry.

In lead and zinc: Andrew Fletcher proposed a method of protecting domestic mining without a tariff which has proven unobtainable in the present political climate. Details are covered on pp 75-79 of this issue.

Frank G. Breyer, Singmaster & Breyer, also weighed in with another view on domestic mining problems. This too is covered in this issue on p 80.

In gold: Joseph F. Little, Denver attorney called for better public relations and more political action. He claimed that if gold prices had maintained a parity with farm prices, the gold miner would now be receiving $75 an oz.

In silver: E. O. Sowerwine, vice president of the Anaconda Co., made the case for silver as money, with supporting statements from the Bible, the Constitution and William McKinley's inaugural address. He pointed out that, despite propaganda to the contrary, the U. S. Government has reaped a $2-billion profit from its purchase of silver.

Simon Strauss, vice president, American Smelting and Refining Co., speaking at the Gold-Silver-Uranium Banquet, warned that metals received by the Department of Agriculture in surplus food bartering are a sword over the head of domestic miners. He urged legislation to forbid bartering for metals unless needed for the military stockpile.

Speaker at the famous Sow Belly dinner which wound up the meeting, was Harold E. Stassen, assistant to the president on disarmament. His keynote was that exploitation of the peaceful potential of the atom is essential for lasting peace.

Among the many uranium sessions, by far the largest crowd (more than 2,000 people) turned out to hear "Some Comments on the Uranium Market" by Jesse C. Johnson, Director of the Division of Raw Materials, U. S. AEC. Mr. Johnson did not keep his audience in suspense for long. In his opening paragraph he stated: "I am sure that the important question for this audience is what is going to happen after March 31, 1962. Will there be an AEC uranium procurement program and, if so, what kind? I am sorry I do not have the answer."

But Johnson did provide food for thought for the miner pondering his post-1962 future. He evaluated the need for uranium this way. "Military requirements will continue to be the dominant factor in the demand for uranium for some time. No significant industrial requirements are expected before 1960 and probably no important requirements until after 1965. Consequently, the Commission's uranium procurement program will continue to be determined largely by what the military wants."

His advice: "The uranium industry should now be considering the future industrial market."

Johnson also pinpointed the major uranium mining areas. "Over 70% of our known ore reserves are in three districts: the Big Indian Wash-Lisbon

FAMILIAR SIGHT to CMA convention goers is Charles Newmeyer (left) editor of the *Mining Record*. Here he gives copy to Lyman C. Huff, USGS, as Miss Joanne West looks on.

TALKING BUSINESS are H. E. Wright, Galigher Co., Salt Lake City, John Ferguson Jr., dinner committeeman, and John Wise, Idarado Mining Co. manager at Ouray, Colo.

Valley area of Utah, the Laguna Indian Reservation, N. M., and the Ambrosia Lake area, N. M.

Preceding Mr. Johnson on the program was Colorado's Lieutenant Governor, Stephen L. R. McNichols, who launched an all out assault upon the AEC for its new policy of competitive bidding for Government leases. He also turned his guns on certain national publications because, "Confidence in the producers has been ripped to shreds by articles . . . with such damning titles as . . . 'The Great Uranium Hunt: More Puff than Paydirt' . . . 'Five Frauds to Watch Out For,' . . . 'The Coming Uranium Bust,' . . . 'Uranium Stocks—The Facts. Wallpaper or Wealth—The Odds are on Wallpaper.' "

Furthermore big brokers from Wall St. to San Francisco's Montgomery St. are, according to Lt. Gov. McNichols, believers in further mangling of the small producer.

A sidewalk survey outside the meeting room, after these two talks, was indecisive. Opinion was evenly divided on what Johnson may have implied about an AEC purchasing program, or lack of one, after 1962.

Likewise there were some people who agreed that McNichols had pointed up a trouble spot. Some didn't share this opinion (actual count 7-5) and two comments were worth repeating. An independent geologist felt that the Lt. Governor was wrong about confidence in the producer being destroyed. To quote, "Those (magazine) articles ripped the confidence in the non-producer—the promotor. Far as I can see, Wall St. and everyone else still have confidence in the producers."

And on AEC's competitive bidding policy: "I think the AEC only has about 5% of the worthwhile leases and the other 95% (in the hands of private enterprise) is sure being handled on a competitive basis."

By and large the uranium miners weren't lamenting their situation and Henry Hough, editor of *Uranium Magazine* may have summed up the feelings of many in an excellent luncheon talk, when he pointed out that miners of other ores would be tickled to death to have a guaranteed price like that for uranium, come what may after 1962.

Brightest of futures for uranium miners was painted by Henry C. Anderson, manager of product planning and development for General Electric Co. He estimated that by 1975 atomic power plants would be consuming over 22,000 tons of uranium a year, an estimate, he admitted, which could be altered rapidly by technical developments.

Enterprising reporter Bob Byers of the *Denver Post* buttonholed Sheldon Wimpfen, ex-manager of the AEC's Grand Junction Operations Office with some questions about the consumption figure. Wimpfen estimated that 22,000 tons of metal would require about 9-million tons of 0.3% ore which is, "several times more than we are producing now in the U. S."

Most of the heavy uranium schedule of papers on the CMA program discussed prospecting and mining techniques, descriptions of new areas, or processing.

Dr. N. E. Berry, technical director, Mallinckrodt Chemical Works, St. Louis, ably handled "Processing of Uranium Concentrates." After the paper was read, a half a dozen mill men were questioned on how they felt about getting into feed materials production. Opinion was split with some saying, "That's not for us; it's a chemical

SMILING QUINTET includes (l to r) H. L. Baker, Boyles Brothers Drilling Co.; O. A. Power, Westvaco Mineral Products; J. A. Marsh, Union Pacific R.R.; W. A. Young, mining engineer, Salt Lake City; and H. B. Fowler, Westvaco.

INTRODUCING Harold Koster of Salida, Colo. (left) to T. O. Evans, A.T.&S.F. Railroad Co., is Roy Wicker of Denver, Colo.

CHECKING THE PROGRAM are James E. Quinn, Denver Equipment Co., sessions chairman, and Harry L. McNiell, Stearns-Roger Mfg. Co., convention vice chairman.

business." Others came right back with, "Of course, we are."

Many of the resolutions submitted in the report of the hardworking Resolutions Committee were off the beaten track as far as past programs of this type are concerned. As a long range program, a resolution was set forth that all foreign competitors of American producers of raw materials should be divided into two classes.

"The first class should be residents of nations which adopt or have adopted the same measures which have contributed to our high standard of living, including the payroll and other taxes borne by both American manufacturers and raw material producers, wage-hour laws and the like. The products of this class of foreign raw material producers should be admitted to this country with either nominal or no duties or tariffs.

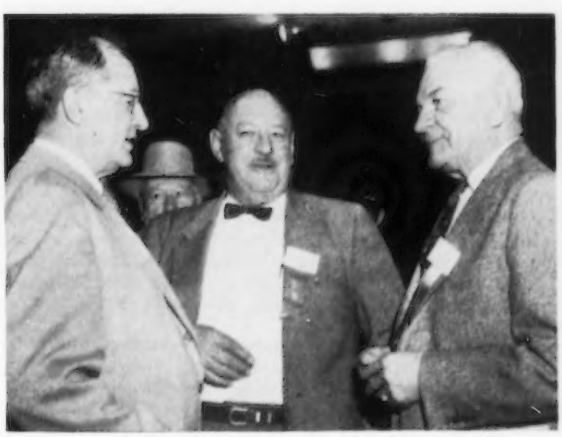
"The second class of foreign competitors should be residents of those nations which refuse to adopt the measures which have contributed to our standard of living, including such payroll taxes and similar legislation. The products of this class of competitors should be admitted into this country only upon payment of such duties or tariffs as will equalize the cost of production of such commodities with the cost of production of similar commodities of American industry."

At a brief press conference the committee said that they realized such a program would have to be carried out very slowly over a period of years, but they felt that in addition to protecting the American miner, the plan would help raise the standard of living of other countries. Asked what nations qualified today in the first class (duty free), Canada and the Scandinavian countries were the only ones named.

For immediate help to the industry, the resolutions recommend the adoption of an excise tax of 2c a pound on imports of zinc and lead whenever the prices fall below 14c for zinc and 16c for lead This is in line with the Fletcher proposal (see p 75).

Specifically recommended among the resolutions was that the Government "maintain a floor price for uranium not less than current prices". It was also suggested that AEC inaugurate studies to determine the feasibility of a fixed price for uranium concentrates, abolition of high lime penalties in the ore, and more equitable payment for metals produced in association with uranium.

Other recommendations included a return to the gold standard, revision of rules on assessment work, abolition of severance and production taxes and establishment of a 23% depletion on gross production.



GENERAL CHAIRMAN of the convention, D. W. Viles, Vanadium Corporation of America, chats with Roy Burkett (left) and C. J. Gillaspey, Arapho Mining & Uranium Co.

EAST MEETS WEST as Monroe Pofcher (left) New York attorney gets the word on South Dakota and Wyoming uranium developments from Clyde Boyles, Sodak Mining Co.

Minerals Policy Seen Based Upon the "Short-War" Theory

A NEW PATTERN in Government metals and minerals policy is taking shape. Its theme is simple: the emphasis is now on those materials which military and defense officials see as absolutely essential in an atomic war.

The Administration's materials policies —including strategic stockpiling, production and development incentive programs, market price guarantees, long-range purchasing plans, tax write-offs, import restrictions — have been under fire from mining-state interests on Capitol Hill for some time. The complaint is that the Government has vacillated on its stockpiling and support measures, continuing or curtailing them piecemeal without enough over-all direction.

Now nearly every move by Government agencies—Interior Department, Office of Defense Mobilization, General Services Administration, Atomic Energy Commission, the Pentagon—is aimed at the minimum goal of assuring adequate supplies of the strategic materials basic to atomic war and at keeping their development, production and market situations healthy.

The new pattern represents a victory for the so-called short-war theorists. This is the school that holds an atomic or nuclear war would last only a matter of weeks or months, and that planning for a longer period of time is costly and unnecessary.

The new policy guide-rule also reflects the basic philosophy of the Administration: Keep Government spending and support to a necessary minimum, let industry work out research, development, production and marketing problems in free competition wherever possible.

Here are some of the recent decisions on Government metals and minerals programs that fit the new standard:

Long-range stockpiling has been cut back, and with less and less money budgeted in the future, the eventual end is in sight (*E&MJ*, Feb. 1956, p. 152.)

Pentagon time schedules for critical stockpiling are being geared to shorter supplies—60-90 days' worth, rather than the present stocks which run up to a year's supply.

ODM, too, has told Congressional committees it is working out a new, shorter "Industrial Readiness Plan" for purchases and stockpiles.

The 14 new Industry Advisory Committees set up by Interior's Office of Minerals Mobilization are reviewing production and market conditions with an eye cocked toward the more "strategic" materials.

Atomic Energy Commission is turning some of its production facilities over to private industry, and the Joint Congressional Committee's special atomic energy task force has recommended steps toward a freer uranium market to supplant the Government price-controlled purchasing system now in effect.

Defense Minerals Exploration Administration contracts are going more and more to developers of uranium, rare earths, tungsten and other strategic and/or scarce minerals.

GSA's purchase programs also are now tailored to "stimulate the search for, and the production of, strategic and critical materials"—such as tungsten, manganese, chrome, mica, beryl and asbestos.

All this doesn't mean the Government is turning to nuclear materials like uranium, tungsten, cobalt, thorium and others to the exclusion of all other materials. Lead, copper, nickel and zinc, for example, are needed in steady supply, and wherever production or market conditions are pinching the flow of a basic metal or mineral the Administration can be expected to continue support measures.

What the new emphasis on strategic and scarce materials does mean is that the various Government agencies charged with administering purchase and support programs can be expected to apply the rule of absolute bare minimum necessity before using them. From now on, the question will be: Is this stockpile, expansion goal, import quota, incentive purchase, or research and development loan necessary to assure a defense supply adequate for a short nuclear war?

A gradual slowing of over-all stockpile operations is expected in the light of the fiscal message sent to Congress by President Eisenhower (*E&MJ*, February 1955, p. 152). The budget contained no provision for new stockpile funds.

Claims Court Decision Favors Gold Miners' Suit for Compensation for WW2 Shutdowns

U.S. COURT OF CLAIMS handed down late last month what could become a precedent-setting decision of vital interest to mines throughout the country. In the long, drawn-out gold mine case, the Court held that the Government acted arbitrarily and illegally in shutting down all gold mines in the country during the war, and at the same time ruled that the mine owners are entitled to compensation for resulting losses.

War Production Board closed down the mines in 1942 to conserve strategic materials which were required by the gold mines, but—the Government felt—were needed more for the war effort. WPB based its ruling on the Emergency War Powers Acts. The mines joined in collective civil litigation against the Government, claiming $120-million compensation, the largest claim ever filed against the Government.

Court of Claims trial was divided in several parts. First to determine whether the WPB order exceeded the War Powers Authority and was arbitrary. Court split 3-2, but found this answer to be yes. Reasoning is that Government already had control over strategic materials through its wartime system of priority allocations, and that the strategic materials were not available to the gold mines, anyway.

Second point at issue was whether the mines are entitled to compensation for their losses. Court here handed down delicate reasoning which in effect conceded that the U.S. Government is not liable for compensation in payment for an illegal act. But, the majority ruled, the Government did have the authority to confiscate or seize the mines, and that since the effect of the shutdown order was the same, the mines are entitled to compensation.

Another trail will be held to determine the extent and validity of the $120-million claim. Meanwhile, Justice Department is a sure bet to appeal the decision to the Supreme Court.

GSA's Incentive Program Will Cost $164-Million

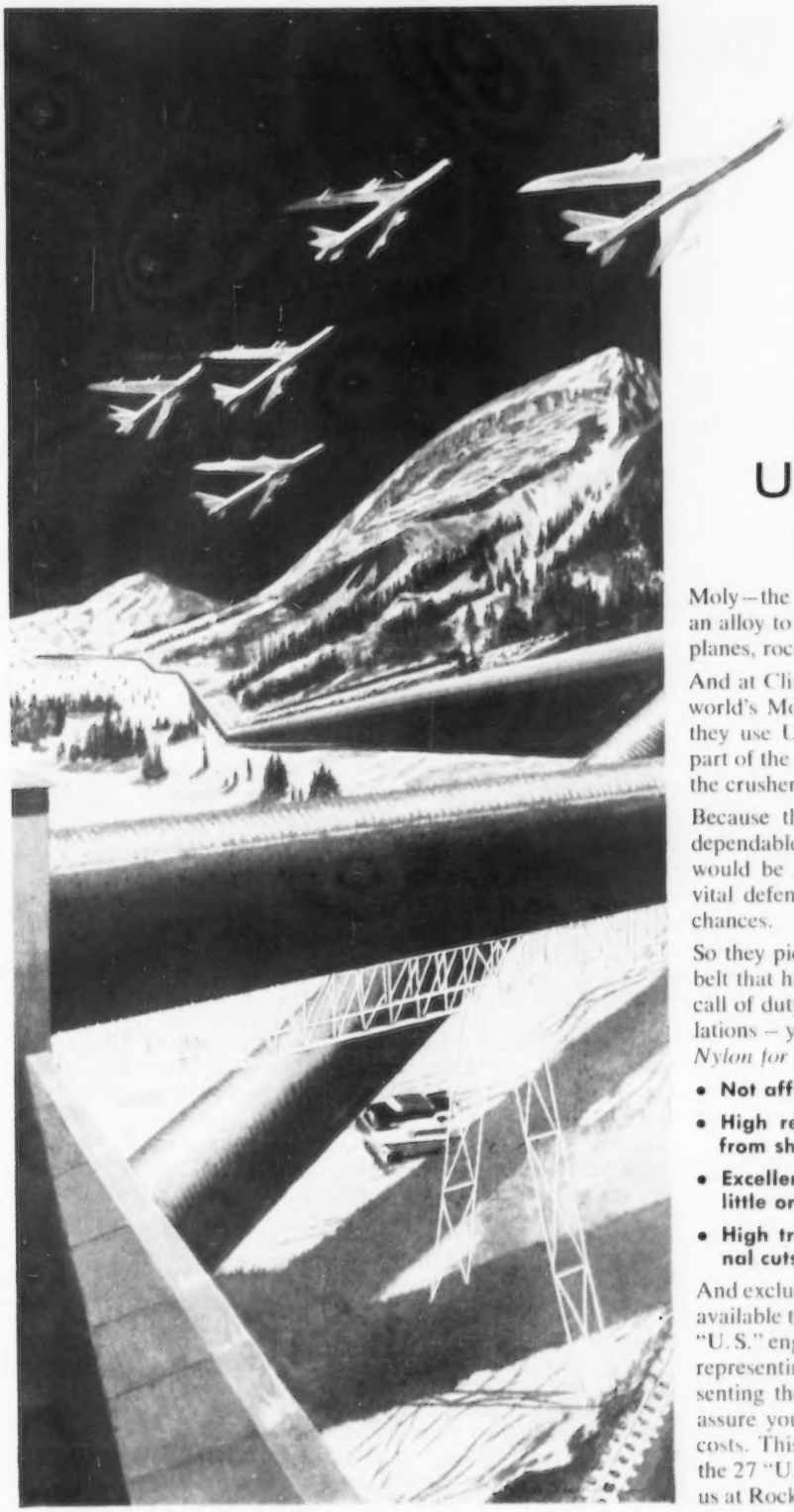
GOVERNMENT'S ABOVE-MARKET-PRICE incentive purchase programs will cost some $164-million before they expire, according to data released by the House Appropriations Committee which heard representatives of General Service Administration testify on the budget last month.

Incentive purchases permit GSA to contract for purchase of domestic mine production of seven critical materials—asbestos, beryl, columbium-tantalum, manganese, mercury, mica and tungsten —at prices higher than the going market price, either for a certain length of time or until a certain quota is reached.

This program is entirely separate from regular Strategic Stockpile purchases, and is aimed at stimulating development and production of the seven minerals. It is also separate from the DMEA contracts program.

By the time these programs run out, depending upon the different time or quota goals for the various materials, the Government will have spent $307.5-million, of which GSA figures to recover $143.7-million, leaving a net loss of some $163.8-million.

GSA figures it will lose—net—$99.6-



Moly for the jet age travels on U. S. Conveyor Belts

Moly—the fabulous molybdenum that's used as an alloy to make high-temperature metal for jet planes, rocket nozzles, guided missiles.

And at Climax, Colo.—where a majority of the world's Moly supply is produced—just why do they use U. S. Rubber belts to convey a large part of the daily production of 30,000 tons from the crusher to the mill?

Because the Climax officials wanted the most dependable belts obtainable—to make sure there would be a steady, *uninterrupted flow* of this vital defense material. They wanted to take no chances.

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- **Not affected by corrosion.**
- **High resiliency dissipates strains resulting from shock.**
- **Excellent troughability and easy training, little or no break-in needed.**
- **High transverse strength; resists longitudinal cuts and tears; resists flexing fatigue.**

And exclusive "U. S." Three-Way Engineering is available to you for any and all belt installations. "U. S." engineers, working closely with engineers representing the operator and engineers representing the conveyor equipment manufacturer, assure you of the *right* belt for lowest haulage costs. This service is obtainable through any of the 27 "U. S." District Sales Offices or by writing us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber

million on its $189.9-million tungsten purchases; $52.9-million of the $71.3-million spent for manganese; and $10.4-million of its $15.1-million worth of mica.

Persistent rumors that Government will continue or extend present tungsten purchase provisions beyond declared limits are in error, according to Washington observers. Aside from stockpile purchases, which are separate, the current tungsten goal is 3-million short tons or June 30, 1958, which ever is first.

GSA reportedly has informed the Office of Defense Mobilization that the 3-million goal will occur first, probably in the next six months.

Program could be extended without Congressional approval if the Air Force or some other defense agency requested it. Such a request now seems unlikely. Air Force, for one, reportedly does not plan to ask ODM to continue the purchases after the goal is reached.

One factor which encouraged the rumors of tungsten extension was that USAF desired it for continuation of alloy research by private industry. Air Force is interested in the research, but sees it as a long-term proposition.

Late Developments

TRADE with Red China is up for Congressional scrutiny again. Senate Permanent Investigation Committee is looking into U.S. allies' shipments of copper, aluminum, magnesium, and other strategic materials to China. Sens. George McClellan (D-Ark.), chairman, and Stuart Symington (D-Mo.), have charged that trade of this sort, particularly by Great Britain, has increased significantly in recent months. Allies claim, on the other hand, that they need the trade and that there is no ban on shipping to Russia itself, so why the furor.

•

SOME NICKEL USERS have been ordering more than they need to fill military requirements, Commerce Department claims after a survey of needs compared to amounts consumed under defense rated orders. As a result, Commerce's Bureau of Defense Services Administration has asked all suppliers not to accept military rated orders and hold up shipments until the orders can be sent to BDSA for checking.

•

PRODUCTION SUMMARIES released by the Bureau of Mines show trends in 1955 for the following materials:

Silver—36.7-million fine oz, down 1% from 1954. **Zinc**—503.8-thousand tons, up from 1954, but 19% below previous five-year average. **Gold**—1.9-million fine oz, up 3% from year before. **Magnesium**—mill shipments of 21.2-million lb, up a whopping 54% from 1954. **Lead**—333.4-thousand short tons, up 2% from 1954, but 15% below previous five-year average.

Labor This Month

AFL-CIO NON-FERROUS INVASION: Plans are under discussion in the newly-merged federation to set up a new union in the non-ferrous mining industry. The aim would be to strip the Mine Mill and Smelter Workers of bargaining rights by organizing a union with the help of anti-Mine-Mill workers in the mines. It would also prevent a possible jurisdictional battle between unions now affiliated in the AFL-CIO who might conflict in attempts to win contract rights at the mine union strongholds.

To set up a new union would mean the end of raiding by the big Steelworkers Union, and others, against Mine-Mill. All efforts would be concentrated in one union with full non-ferrous jurisdiction. However, there may be resistance from the Steelworkers Union, which wants the present Mine-Mill membership, as well as the Teamsters. The truck union is now operating under a mutual assistance pact with Mine-Mill and may fight the cause of the independent mine union.

MINE-MILL TAKES ON TARGETS—AND TROUBLES: This month's 51st convention of MMSW finds the mine union beset by internal difficulties, greater than it has ever faced. It may mean a housecleaning. Many of its former leaders have departed in the past 12 months, in some cases under pressure. Government charges of Communism have forced several resignations, others have been demoted. Current leaders are on edge.

In this atmosphere the convention session, held in Salt Lake City, must set its bargaining goals for the months ahead. The talk is optimistic. Mine-Mill officials will open a campaign for a "substantial" wage boost, citing these reasons why they expect to win good 1956 contracts:

- High prices, and bigger profits, in the non-ferrous industry mean a bigger share for Mine-Mill members.
- Non-ferrous companies will be out to avoid a major strike. Union officials believe the industry will want peaceful negotiations because a strike would hurt the economy and react against the Republican party in an election year.

POLITICS—A NUMBER ONE UNION ACTIVITY: Through the AFL-CIO, organized labor is moving deeper than ever into the political arena. Many of its programs are now tied to the election booths; organizing, union security, and even wages. Union leaders have discovered that where the programs stall through resistance by management, the same ends can be gained on the legislative front.

As a result, they're going all out for the 1956 elections. Plans are under way to collect $3-million in voluntary contributions from union members to carry on political activities. Extensive information on all candidates will be sent to the full 15-million AFL-CIO membership, funds will be donated to political races, extensive use will be made of television and radio. Emphasis will be on getting the rank-and-file to take an interest in local campaigns, to set up their own operations.

The goal is a Democratic victory, both in the White House and in Congress. They view a pro-union atmosphere in Government as a necessary by-part of the coming national organizing drive, to create a favorable "climate" for union organizers. A pro-union Congress might help the cause with union-sought legislation, while the reverse might bring tighter clamps on labor through new laws. On wages and union security, union politicians want a Congress that will look favorably on another raise in the minimum wage and Federal action that would bar states from outlawing the union shop.

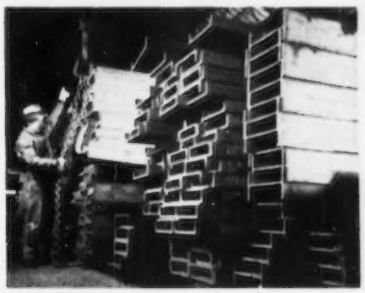
But, labor's assessment is that it can't be done this year. They estimate it would take too many upsets to put all the needed candidates into office. And, their own political organization isn't ready.

Management, through some Republicans in Congress, is taking the counter-offensive to stall labor's drive in the beginning. The plan is to keep union leadership from donating collections from workers to any particular candidate on the theory that the member has no choice in the matter.

STEEL BUYERS GUIDE to Ryerson Products and Services

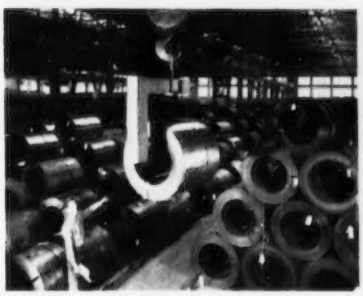
You can draw on your nearby Ryerson plant for an almost endless number of products and services—and the more you concentrate your purchases at one source, the more you save. Ryerson products not pictured here include: Re-bars, expanded metal, grating, plastic pipe, machinery and tools, etc. See your Ryerson catalog for complete list and write for descriptive literature.

BARS—The most complete range of types, shapes and sizes as well as the largest tonnage.

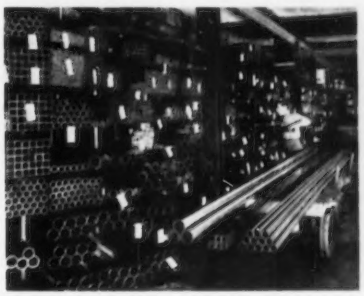


STRUCTURALS — I-beams, H-beams, channels, angles, tees and zees—all to ASTM spec. A-7.

PLATES—14 types including special low carbon plates for forming and welding, leaded E-Z-Cut, etc.

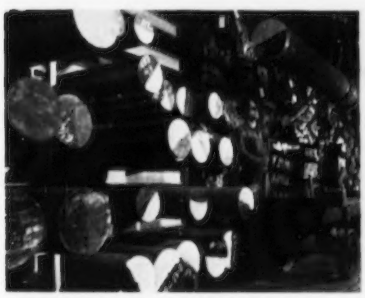


SHEETS & STRIP—More than 20 different types in pattern sizes, cut-to-order sizes, strip coils, etc.



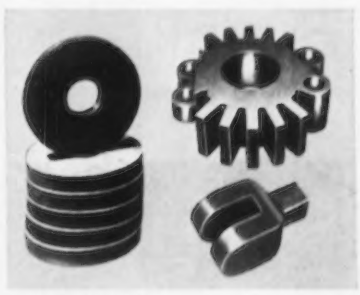
TUBING—Seamless and welded mechanical tubing, fluid power tubing, structural and boiler tubes, etc.

C. F. BARS—Cold finished steel for every use: screw steel, Ledloy, accuracy stock, machinery steel, shafting, etc.



ALLOYS—Every type including leaded alloys for fastest machining, all performance-proved by tests.

STAINLESS—Allegheny stainless in over 2,221 sizes, shapes, types, finishes: sheets, plates, bars, pipe, etc.



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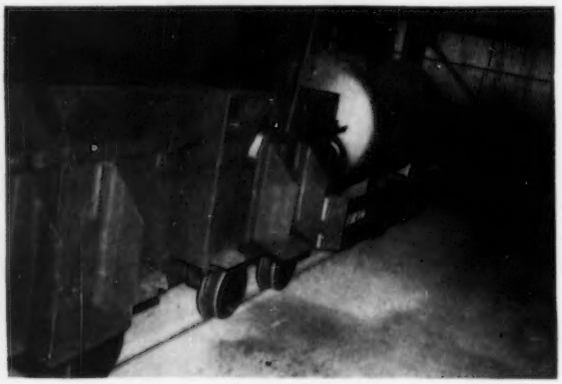
OPERATING IDEAS

LLOYD E. ANTONIDES, Assistant Editor



IN MILL, grinding balls are transferred from rail cars to storage bins with magnetic crane. From bins, balls dump into cars which have side gates for easy discharge into ball mills. Compressed air locomotive moves cars from bins to ball mills.

San Manuel Finds These Useful

AT SUPPLY SHAFT, bulk loader used in yard serves another purpose. It is used to move mine supply cars to and from collar. At collar itself, car-stop block consists of three plates welded together. Middle plate projects and fits into slot formed by two plates welded into gap cut in rail. Tops of rail and slot are flush. Attached chain keeps stop from being lost.

Salt Water Frees Frozen Track

SPRAYING SALT WATER over dry salt sprinkled along frozen tracks eases winter track shifting at Kennecott Copper Corp.'s Bingham Canyon open pit. Two or three days before shifting, a special car spreads dry salt along the section to be moved. Then two converted 12,000-gal steam locomotive tenders follow and saturate the section with salt water. On shifting day tracks come free with relative ease.

In Kennecott's case, Great Salt Lake is a convenient source of salt water. Prior to adopting the scheme as standard practice, various methods were used—hand labor with picks and shovels, pneumatic drills, railroad flame throwers and even dynamite—and many thousands of rail ties were destroyed in the process. Dry salt alone was effective only if there was enough moisture to dissolve it. Then the salt water spray was tried on the dry salt with highly effective results. Not only is track shifting an easier job but the expense of new ties is reduced as well.

Rear Dump Solves Bin Problem

FOR REPLACING six old 8-yd side dump trucks, Cia. Peruana de Cemento Portland, Atacongo (near Lima), Peru, found two C&D Movalls ideally suited. Long 2-mile haul from limestone pit to crusher made larger haulage units desirable. But crusher feed-bin capacity was only 8 cu yd. Their answer was to use 31-ton capacity (25 cu yd heaped) Movalls whose positive ejection end-dump feature permits dumping at controlled rate.

Wagon, an RD2036 made by C&D Mfg. Co., Perkins, Calif., is towed by a DW20 prime mover made by Caterpillar Tractor Co., Peoria, Ill. Front face of pan is pulled rearward by cables exerting 70-ton push to clean bed. Rear gate, hinged at bottom, is lowered by cables. Unit can handle rock or dirt, sticky or dry. Interchangeable yoke lets prime mover switch from scraper to wagon with ease. Smaller 22-ton units are available too.

The two 6-cell No. 18 Special Denver "Sub-A" Flotation Machines at Arizona Barite Co. Larry Mathis, Mill Superintendent, adjusts the pulp level in each cell by hand-operated weir gates.

Arizona Barite Co. has replaced no parts on Denver "Sub-A's" in operation since 1948

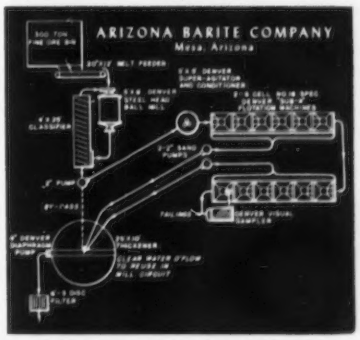
"Arizona Barite Co., Mesa, Ariz., installed a 6-cell No. 18 Special (32 x 32) Denver 'Sub-A' Flotation Machine in June, 1948, for roughing. At the same time, we added a second 6-cell No. 18 Special Denver 'Sub-A' Flotation Machine for cleaning. Due to the conditions of the ore, this setup was not practical, so the 'flexibility' feature of the Denver 'Sub-A' Machines was used to hook them in tandem.

"Since the original installation, no wearing parts have been replaced after 47,450 hours of continuous operation. The only maintenance has been replacement of V-belts and lubrication. We estimate another two years' wear on impellers before replacement is necessary."—Larry Mathis, Mill Superintendent.

This is a specific example of one of the reasons why mill operators depend upon Denver "Sub-A" Flotation Machines for hard, continuous operation, as well as high metallurgical efficiency. The same high profit operation is available to you.

If you are interested in the low maintenance features and metallurgical efficiency features of Denver "Sub-A" Flotation Machines, write for DECO Bulletin No. F10-881. If you are interested in the complete story on "Benefication of Barite at Arizona Barite Company," write for Engineering Notebook Bulletin No. M4-B56.

An interesting note here is that the Denver "Sub-A" Flotation Machines are operated in series and each cell produces a finished $BaSO_4$ product without cleaning or recleaning, due to the selective action of the Denver Flotation Machine. A higher grade product can easily be made by cleaning the concentrate. Part of the present cells could be devoted to the cleaning action when necessary. This flexibility enables them to easily take care of any changing requirements in their product.



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*The Denver Visual Sampler, installed at the tail end of the flotation section, paid for itself in two weeks.

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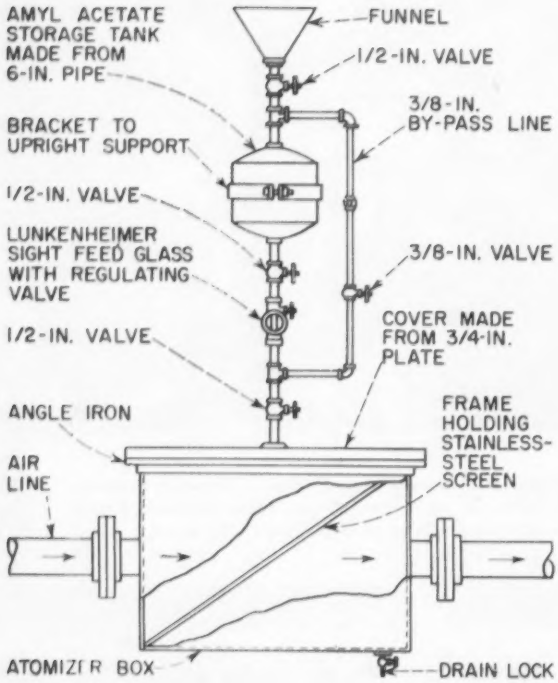
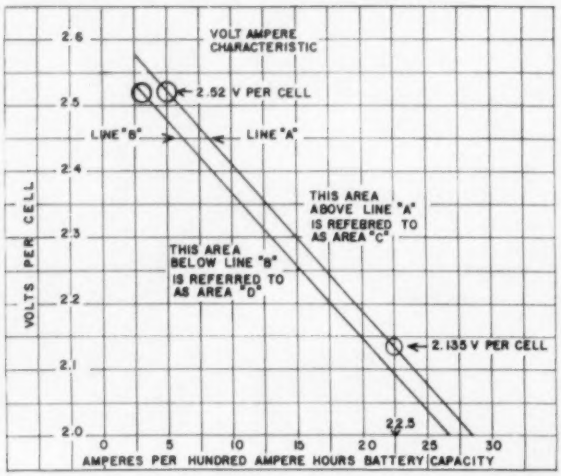
OPERATING IDEAS *(Continued)*



Stench Warner Is Simple

SIMPLE YET EFFECTIVE stench warning system was evolved by Phil Keast, master mechanic, and is in use at the gold properties of Empire Star Mines Co., Ltd., Grass Valley, Calif. It is a stench injector unit for introduction of amyl acetate into the air lines to warn men underground of any accident or fire, as required by state law. All component parts were made from scrap materials. Feed of amyl acetate is controlled by a valve system made up of three ½-in. valves, one ⅜-in. valve, and a Lunkenheimer sight feed glass with regulating valve (similar to lubricator). The atomizer box contains a sloping stainless-steel screen. Amyl acetate is atomized in a simple manner. When it drips onto the screen it is immediately atomized by the passing air stream and subsequently carried throughout the mine. Excess liquid or water can be drained from the atomizer box through a small drain cock at the bottom of the box. Piping assembly is given extra stability by steel upright bolted to the box cover. Bracket fastens storage tank to upright.



Battery Charger Check Is Easy

CORRECT CHARGING means charging a discharged battery within a specified period (usually 8 hr) without overcharging, overheating or excessive gassing. You can now check if your charging equipment is doing that, with diagram developed by engineers of Gould-National Batteries Inc., Trenton, N. J. See graph above.

Charging too fast decreases battery life. Charging too slowly gives a longer charging period or undercharged batteries. Ampere flow at start of charging, known as "starting rate," is usually high. Later in charge, it is reduced to "finishing rate." Manufacturers say finishing rate under 5 amp per 100 amp hr of battery rated capacity, gives best results. Starting rate may be 4 or 4½ times greater or 20 to 22.5 amp per 100 amp hr.

To use graph, first change scales to fit your battery. Voltage scale is multiplied by number of cells in your battery. Ampere scale is multiplied by factor: rated capacity (in ampere hours) divided by 100. Then while battery is charging read both voltage and amperes frequently. Plot these readings on your graph.

If points fall between lines "A" and "B", your charging equipment is well adjusted. It is neither too slow nor too fast. Battery life will be excellent.

If points fall above line "A", i.e. in area "C", charging is completed too quickly. There will be excessive gassing and temperature increase.

If points fall below line "B", i.e. in area "D", both starting and finishing rates are safe but charging may need more than 8 hours. If more than 8 hours can be allowed to complete the charge, equipment should not be adjusted and rate of charge should not be increased.

Follow these tips in conducting test. First, use personnel familiar with batteries and charging equipment. Second, study manual and instructions of the equipment manufacturer. Third, charging equipment, not battery, is being tested so use battery which is in good condition and not defective in any way. And make sure equipment itself has no obvious malfunctions. Finally, let charging equipment warm up before test.

To help you construct your own graph, in basic one shown: line "A" is drawn through point at 2.52 v (per cell) and 5 amp (per 100 amp hr), it also passes through point at 2.135 v and 22.5 amp; line "B" is parallel to line "A" through point at 2.52 volts and 3 amp. To make your's, just multiply voltage scale by number of cells and ampere scale by number of 100 ampere-hours.

Valves Last Long

RESURFACING old diesel engine valves with a hard face weld makes them last twice as long as standard new parts would, according to officials at the Reading Co., Reading, Pa. Not only do they last twice as long but they can be resurfaced again and again for even longer life.

Valves to be resurfaced are first machined to give groove for hard surface deposit. Then they are placed in handy jig shown in photo. Operator next deposits Linde Air Products' No. 6 Stellite rod using an oxy-acetylene blowpipe. Final step is grinding weld deposit down to size, and valve is ready for reuse.

Linde passed this along to us.

HOW TO GET

RIGHT POWER AT LOWER COST

Installed as original power in this ¾-yd. Lorain shovel, a CAT* D4600 Diesel Engine has racked up more than 8700 profitable hours for Glenwood Mining Co., Inc., Glenwood, Ala. The unit stays steadily on the job, digging and loading about 175 tons of brown iron ore per 10-hour day, 5½ days a week, the year around. I. D. Gibson, company president, says, "This Cat Engine has plenty of power, even in hard digging."

Excellent though this engine's performance is, the new line of Caterpillar Diesels will deliver even more power with less down time at lower cost. The Cat D318, for example, is ideal for installation in shovels like the one shown here.

Like all Caterpillar Engines, the 4-cycle D318 is compact for easy installation. It is also available with torque converter for smooth power application and ease of operation. It idles without fouling, and runs cleanly and efficiently even on low-cost No. 2 furnace oil, thanks to its tinker-free Caterpillar fuel injection system. And it owes its trouble-free work life to such quality features as "Hi-Electro" hardened crankshaft journals, aluminum alloy bearings, and highly effective oil and air filters.

Leading manufacturers can supply Caterpillar Engines as original power in their equipment. And your Caterpillar Dealer can install one of these rugged 4-cycle diesels when it's time to repower your present equipment. He will gladly advise you on the engine from the broad Caterpillar line that will suit all your mining operations. Count on him, too, for skilled service and factory parts you can trust. Why not give him a call today?

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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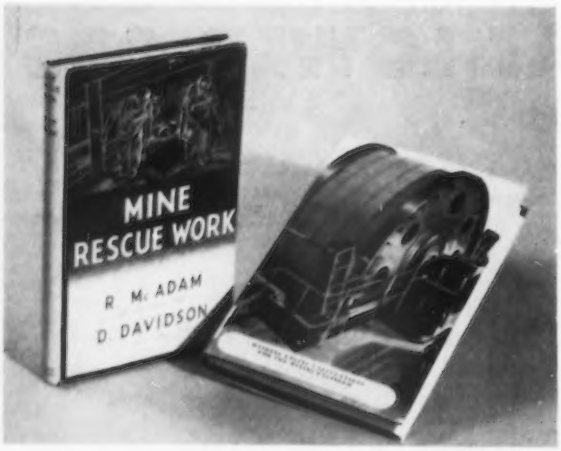
MODERN
HEAVY-DUTY POWER

NEW BOOKS



Mine Rescue Work, by R. McAdam and D. Davidson. An up-to-date text on mine safety for mining students, safety engineers and a reference book for rescue teams and management. Approximately half the book is given over to study of various types of breathing apparatus available in Great Britain, U. S., France and Germany. It discusses their design, function, where and when they can be used.

Resuscitation, transport of casualties, fire-fighting and mine gases are detailed in the second part. Rescue and fire-fighting plans and organization of rescue work are also discussed. A valuable fire-fighting and rescue tool, even though emphasis is on coal mining. Published by Oliver and Boyd, Tweeddale Court, Edinburgh; 39 Welbeck St., London. 179 pp. and plenty of photographs. Price 21/.

Winding Engine Calculations for the Mining Engineer, by A. B. Price. Second edition of work first published in 1951. It includes inclined shaft problems, steam winders, cylindrical drums, double drums, Koepe hoist and multiple-rope Koepes. Published by Fraser and Chalmers Engineering Works, General Electric Co., Erith, Kent, England. 152 pp. Price 30/.

The Metallurgy of Zirconium, by Benjamin Lustman and Frank H. Kerze, Jr. National Nuclear Energy Series, Division VII, Volume 4. Details occurrence, reduction, refining, properties, alloys and uses of zirconium. Atomic Energy Commission and U. S. Navy contributed greatly to the book. The most complete and up-to-date reference book on zirconium. Much of the material was heretofore classified. 747 pp. Price $10.00.

1955 Book of ASTM Standards, Part I, Ferrous Metals. Contains 125 more standards than 1954 edition. Can be obtained from American Society of Test Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 1834 pp. Price $13.50.

Oil and Uranium Rocky Mountain Redbook Directory. First edition (July 1955) includes in handsome, neat, well planned heavy plastic covered, loose-leaf notebook all the oil and uranium personalities and companies in the area. Individuals, producers and suppliers listed by name and address as well as occupation. Published by Oil and Uranium Redbook, P. O. Box 282, Boulder, Colorado. 122 pp. Price $18.

Preventive Maintenance of Electrical Equipment, by Charles I. Hubert. Treats preventive maintenance programs for motors, generators, controllers, electronic equipment, batteries, transformers and lighting. Also contains chapters on trouble shooting and correct operating techniques. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 208 pp. Price $4.

1,000-Million Years on the Colorado Plateau, by Al Look. Mr Look spins an interesting yarn on the paleontology and archaeology of the Colorado Plateau. Book was published in 1951 as *In My Back Yard.* Author tends to get a little flip with his quips, but its interesting reading by a man who knows his way around the fossil bone yards. Published by Bell Publications, 2400 Curtis Street, Denver 5, Colorado. Pictures, line drawings and 337 pp. Price $3.75.

Toxicologic Study of Calcium Halophosphate, Phosphors and Antimony Trioxide, by Paul Gross, J. H. U. Brown, Marian L. Westrick, Raymond P. Srsic, Nancy L. Butler, Theodore F. Hatch and H. H. Schrenk. Acute and chronic toxicity, pharmacologic aspects and pulmonary studies of dust. Reprinted from AMA Archives of Industrial Health by Industrial Hygiene Foundation, Mellon Institute, 4400 5th Ave., Pittsburgh 13, Pa. 14 pp. Price unknown.

American Medical Association Archives of Industrial Health, August Issue, 1955. Contains papers on the biological action of quartz, potassium carbonate, rare metals, tantalum oxide, cobaltic oxide, cobalt, tungsten, its carbide, radon in deep level mines, dust control, talc, beryllium, asbestos, coal and gypsum. Monthly publication of AMA, 535 North Dearborn St., Chicago 10, Ill. Price $1 per single copy or $8 per year in the U. S., $8.50 in Canada and $9 elsewhere.

Southern Africa, Volume I, Physical Geography, by John H. Wellington. Part II appeared in June. Covers the whole division of Africa to the south of the Congo-Zambezi watershed. Details in three parts the geography, climate, vegetation, soils, and hydrography of the area. Volume I and II no doubt will become standard reference texts on the subject. Very well done. Published by Cambridge University Press, 32 E. 57th St., New York 22, N. Y. Figures, tables, 96 photographs and four foldout maps in 508 pp. Price $12.50.

Metal Statistics, 1955. Published by American Metal Market, 18 Cliff St., New York 38, N. Y. Buyers guide and statistics on almost all the commercial metals. 864 pp. $3.50.

• Application for the following free literature should be made to the address below. Because of the limited editions, only one copy of any particular edition can be sent to any one person and only a modest number of a variety of publications can be furnished to an applicant. Please order only those publications actually needed. Publications Distribution Section, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Information Circular 7726, Uranium Mining on the Colorado Plateau, by W. L. Dare, R. A. Lindblom and J. H. Soule. First of a series of publications describing uranium mining on the Plateau. Later papers will deal with exploration, development, mining methods and costs. Paper admits to being elementary, but will serve as a source of information for people who are interested, but unfamiliar with mining. Maps, photos and text in 60 pp.

Report of Investigation 5141, Titanium Plant at Boulder City, Nevada; Its Design and Operation, by C. T. Baroch, T. B. Kaczmarek, W. D. Barnes, L. W. Galloway, W. M. Mark and G. A. Lee. Plenty of photos and 76 pp.

Report of Investigation 5142, Manganese From Steel-Plant Slags By a Lime-Clinkering and Carbonate-Leaching Process: Part 2 Pilot Plant Development (in two parts), by R. A. Heindl, J. A. Ruppert, M. L. Skow and J. E. Conley. Process will produce good quality product, but at high cost. Flowsheets, photos and 80 pp.

Report of Investigation 5163, Concentration Tests of Selected California-Nevada Manganese Ores, by A. L. Engel, H. J. Heinen, Edward Morrice and E. S. Shedd. Nine samples representing low grade ore from known deposits tested. Only simple methods of beneficiation were tried. Gravity, flotation and acid leach. Text and tables in 12 pp.

Report of Investigation 5168, Methods of Analyzing Titanium Sponge and Intermediate Products, by P. R. Perry, R. W. Lewis and T. A. Sullivan. Methods offered are not claimed to be preferred or standard. Purpose of program was to make the choice of methods easy for the analyst not having extensive bibliography handy. 45 pp.

Two Blowers . . . One Purpose: 30 to 100% More Air

Why two totally different blower types? Because the requirements of mine ventilation fall into two entirely different categories.

For high pressures, long pipe lines, use the Coppus VENTAIR® (centrifugal type). For medium pressures, shorter pipe lines, the Coppus VANO® (propeller type) is best. One or the other will give you more air per given power consumption than other blowers — from 30% to 100% more. Can be used as blowers or exhausters, capacities up to 90,000 CFM, with compressed air or electric motor drive.

Only Coppus makes both types. And, for quick recognition, each wears the famous "Blue Ribbon", distinguishing mark of top-quality engineering, materials and performance. This blue band is your guarantee of better mine ventilation . . . Look for it.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, Worcester 2, Mass.

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PERSONALS

Nevada Mining Association Officers

NEWLY ELECTED officers of the Nevada Mining Association are (left to right) **Norman E. Hanson,** assistant to the president, Basic Refractories Inc., president; **F. A. McGonigle,** general manager and vice president, Manganese, Inc., first vice president; **Roy A. Hardy,** consulting engineer, Getchell Mines, Inc., second vice president; and **Louis D. Gordon,** executive secretary. All elected officers were also named to the board of directors. Meeting was held in Reno, Nev., on January 9. John C. Kinnear Jr., gen. mgr., Kennecott's Nevada mines division, was named honorary president.

Franc. R. Joubin, president of Algom Uranium Mines, Ltd., has resigned his position to return to the field of geology. He is succeeded by **W. H. Bouck,** vice president of the company and a close associate and principal with Mr. Joubin, and Joseph Hirshhorn in the initial discovery and development of the Algoma uranium field. Mr. Joubin will remain a director of the company.

Howe Sound Co., has announced the following changes in personnel in its exploration department, and the opening of three new exploration offices: In Canada, Britannia Mining & Smelting Co. subsidiary with offices in Toronto and Vancouver, headed by **Frank Ebbutt** and assisted by **Nelson Hogg** in Toronto, and **Allen Killin** and **John Lamb** in Vancouver. **Harold B. Smith** will direct activities in the new Salt Lake City exploration office, assisted by **T. L. Wilson.**

H. F. Devens has been named manager of the Mississippi Aluminum Corp., Gulfport, Miss., a subsidiary of Olin Mathieson Chemical Corp.

Philip D. Wilson, consulting mining engineer and geologist, has been named president, and **Robert P. Koenig,** president of Cerro de Pasco Corp., has been named vice president of the Mining & Metallurgical Society of America for the coming year.

James Fentress has been named general sales manager of Foote Mineral Co. He was formerly director of economics planning.

C. D. Michaelson, formerly vice president and director of the Braden Copper Co. in South America, has been appointed general manager of the Western Mining divisions of Kennecott Copper Corp. He was named to his new post following the appointment of **J. P. Caulfield** as assistant to the vice president of Kennecott in New York.

Gordon Glover has been transferred to the company's operations at Bayard, N. M. as general mill foreman for United States Smelting Refining & Mining Co.

Ralph Chatfield has been promoted to junior geologist at the Lark Section of United States Smelting Refining & Mining Co.

James S. Dodge, formerly AEC staff geologist in Washington, D.C., is now consulting mining geologist, Phoenix, Ariz. Prior to joining AEC, he was mining geologist with Natural Resources Section, SCAP in Tokyo, and with the Anaconda Copper Mining Co. in Butte, Mont.

Dr. Kenneth L. Cook, professor and head of the geophysics department, University of Utah, has been named chairman of the mining, geology and geophysics division and director ex officio of the AIME.

Dr. William Embry Wrather has retired as director of the U.S. Geological Survey, after 12 years of service in this capacity.

J. A. Russell, an engineer and president of the Edmonton Concrete Block Co., has been named to the board of directors of Commercial Minerals Ltd., Edmonton, Alberta, Canada.

John H. Baker, mine superintendent at Bonanza, Utah, for American Gilsonite Co., has been named assistant to the general manager of production at Salt Lake City, Utah. **Paul Borden** has been named mine superintendent.

F. V. C. Hewett has been named general manager of McIntrye Porcupine Mines, Ltd., Toronto, Canada.

S. Frank Isler, former manager of the company's alloy producing plant in Cambridge, Ohio, has been named director of industrial relations of Vanadium Corp. of America. **Dale Zumbrunnen** succeeds Mr. Isler at Cambridge.

Charles H. Burgess has been named vice president of Bear Creek Mining Co. He joined the company in 1952 as a district geologist.

Dr. John G. Dean, chemical and metallurgical consultant, has been retained by Climax Molybdenum Co. to advise on certain aspects of the company's recently expanded chemical program.

William B. Towner has been named general production manager of Foote Mineral Co., directly responsible for the company's three producing units at Exton, Pa., Sunbright, Va., and Kings Mountain, N. C. He was formerly Exton plant manager.

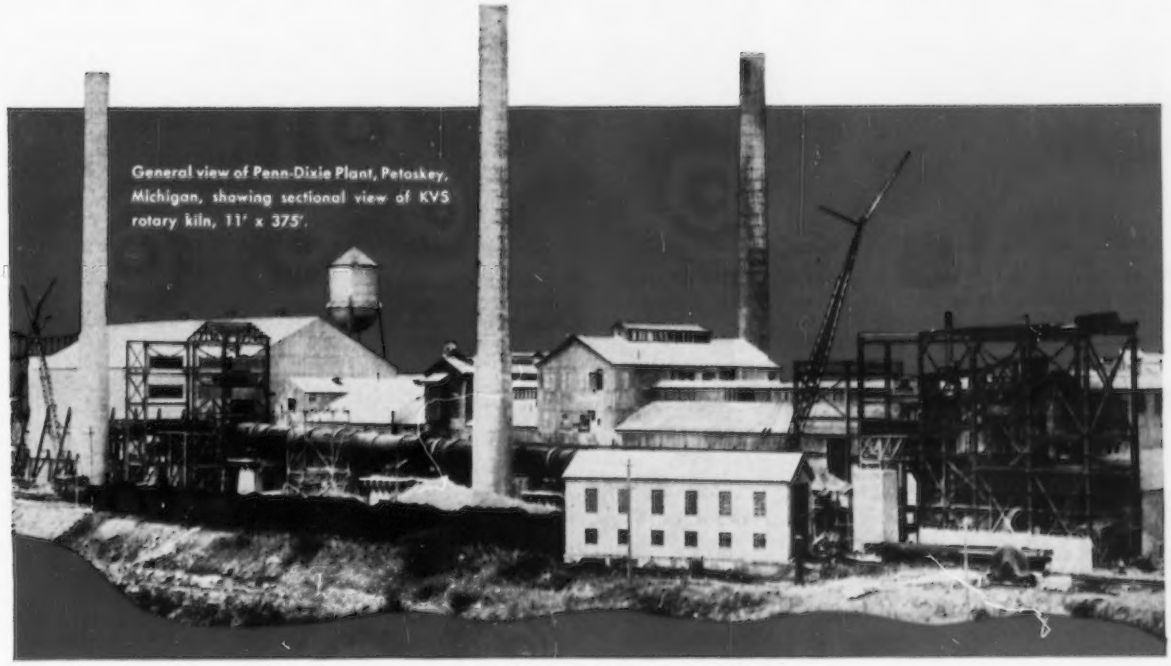
Dr. Thomas B. Nolan, assistant director since December 1944, has been appointed by President Eisenhower to succeed Dr. William E. Wrather as director of the U. S. Geological Survey.

Frank J. Koegler has been elected to the board of directors of National Lead Co. A company vice president, he is also general manager of its Doehler-Harvis division.

Phil Blazovic Jr., production manager of Carbola Chemical Co., has resigned to join the consolidated feldspar department of International Minerals & Chemical Corp., Erwin, Tenn., as assistant manager.

William Newman, metallurgical engineer, has left San Francisco to join the Acoje Mining Co., Inc., in Zambales Province, Western Luzon, P. I., as mill superintendent.

KENNEDY MACHINERY AND EQUIPMENT DESIGNED TO INCREASE CEMENT TONNAGE AT PETOSKEY PLANT OF PENN-DIXIE CEMENT CORPORATION



General view of Penn-Dixie Plant, Petoskey, Michigan, showing sectional view of KVS rotary kiln, 11' x 375'.

Machinery and equipment for a modern plant... designed and manufactured by KVS to meet the rigid requirements of the Penn-Dixie Cement Corporation for their Petoskey, Mich. Plant.

The additional machinery includes, two-compartment Clinker Grinding Mill . . . Three compartment Raw Wet Grinding Mill . . . Rotary Kiln, 11 ft. x 375 ft. . . . Complete with auxiliary equipment. The installation of this new machinery will increase the annual rated capacity of this fine plant by 54%.

The KVS trade mark on any type of machinery used in the manufacture and processing of cement, lime, aggregates, non-metallic ores, etc., is synonymous with top quality. In use the world over, KVS Machinery and Equipment has an enviable reputation for peak capacities, economical operation, and low maintenance costs.

Let our engineers show you how KVS Machinery and Equipment will increase the output, efficiency and operating profits of your plant.

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PERSONALS (*Continued*)

ADIN A. BROWN, general manager of the Mexican mining department, has been elected a director and vice president in charge of mining operations of American Smelting & Refining Co., succeeding R. F. Goodwin, who is retiring.

JOHN R. O'CONNELL JR. has joined the staff of *Engineering & Mining Journal* as assistant market editor. A journalism graduate of Washington and Lee University, he formally wrote publicity for Malkin Public Relations in New Jersey.

Charles E. Prior has been named consulting mining engineer to Western Gold and Uranium, Inc., and its subsidiary, Golden Crown Mining Co. Mr. Prior was formally with American Smelting & Refining Co. as resident engineer.

Allen D. Look, subdistrict supervisor, accident prevention branch, U. S. Bureau of Mines, Phoenix, Ariz., has been transferred to Duluth, Minn., as a district supervisor.

W. M. Peirce has been named assistant to the executive vice president of New Jersey Zinc Co. With the company for 36 years, Mr. Peirce is a past president of the AIME.

W. B. Gallup, chief geologist, Royalite Oil Co. Ltd., has resigned to join a consulting geological and geophysical firm of Gallup, Buckland and Farney, Ltd., of Calgary.

J. W. Woomer & Associates, consulting mining engineers of Pittsburgh, have recently completed engineering work for rehabilitation and modernization of a group of eight iron mines in France. **J. R. Woomer** has returned from India where the firm is completing design and installation of an iron mine operation.

Louis S. Cates, chairman of the board of Phelps Dodge Corp., and Secretary of the Treasury **George M. Humphrey,** have been elected honorary members of the AIME. Mr. Humphrey was former chairman of the M. A. Hanna Co.

F. H. Stewart, vice president and general manager of its subsidiary, Southwest Potash Corp., has been named manager of mining and exploration of American Metal Corp., Ltd. **W. Aubrey Smith,** assistant general manager of Southwest Potash Corp., succeeds Mr. Stewart as general manager.

W. C. Lawson, general manager, Phelps Dodge Corp., Douglas, Ariz., has been named chairman of the program committee of the 1956 Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress, to be held October 1-4 at Los Angeles.

Officers of the newly-formed Mines Development International, Inc., are **George W. Martin,** president; **Robert E. Lawrence,** vice president and technical director; **William H. Cauley,** chairman of the board; **Louis Sabatino,** secretary; and **Harry Wilson,** treasurer. The corporation holds interests in concessions in Honduras and Ecuador for both minerals and oil.

Herbert Allen, head of the New York investment banking house of Allen & Co., has been elected chairman of the Benquet Consolidated Mining Co., operating in the Philippines.

Northern Pacific Railway Co. has announced the following appointments: **G. R. Powe,** manager, mining properties and Eastern lands, except oil; and **D. W. Lindgren,** mining geologist.

Leon Cole, senior vice president of the Atlas Corp., has retired after more than 17 years with the company. He will continue on a part-time consulting basis.

Tait E. Siebenthal, superintendent of M. A. Hanna Co.'s properties in Fillmore County, Minn., has retired after 45 years of service. **Cyril A. Pederson,** assistant superintendent, has succeeded Mr. Siebenthal.

Following officers were elected for 1956 at the meeting of Northwest Scientific Association in Spokane, Wash: **F. B. Farquharson,** director of the University of Washington's experiment station, president; **S. W. Hobbs,** UCGS in Spokane, vice president; and **Dr. F. J. Schadegg,** Eastern Washington College of Education, re-elected secretary-treasurer.

Arnold Hoffman, president of Towne Mines Corp., has been appointed a director of Mesabi Iron Co. He is also a director and officer of several mining companies in Canada and Mexico.

L. W. Shelton has been named general purchasing agent of Kennecott Copper Corp., succeeding **R. Park Lamborn,** who retired but will continue with the company in special assignments of an advisory nature. **W. K. Field** has succeeded Mr. Shelton as assistant general purchasing agent.

Howard W. Balsley, director of Seaboard Oil & Gas Co., has been appointed to the executive committee of the National Uranium Institute.

Gordon H. Chambers has been named chairman of the board, Foote Mineral Co., Philadelphia, Pa., and **L. G. Bliss** has been elected president. Mr. Chambers, formerly president, succeeds **H. C. Meyer,** who retired. Mr. Bliss was formerly senior vice president.

John C. Dale, general manager, Canadian Utilities, Ltd., has succeeded **T. P. Fox,** president of Associated Airways, as president of the Edmonton-based Alberta and Northwest Chamber of Mines. New vice presidents are **Prof. E. O. Lilge,** University of Alberta; **W. V. Wilkin,** president of Wilkin Insurance Ltd., and **Paul H. Carpenter,** manager of James Richardson & Sons Ltd.

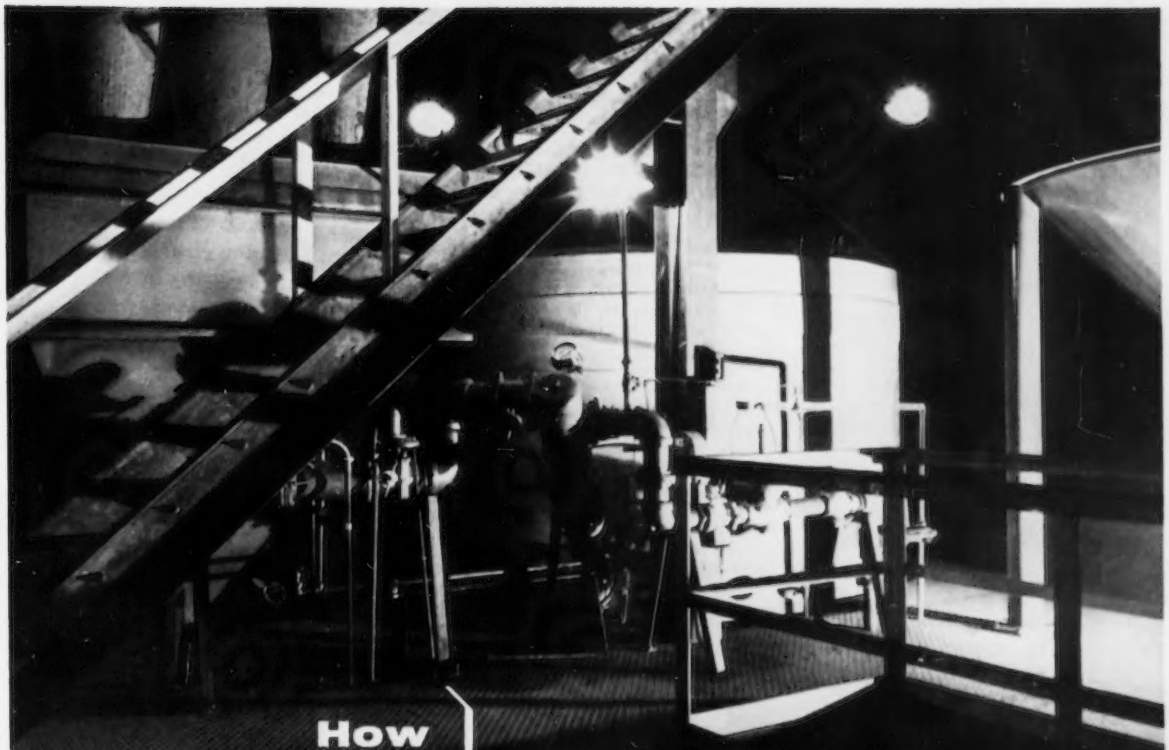
Robert Hendricks, former assistant to the president, Consolidated Mining & Smelting Co. of Canada, has been named vice president in charges of sales. He is succeeded by **F. L. Hallam.**

J. A. C. Ross, general manager; **Alfred H. Hauser,** vice president of Chemical Corn Exchange Bank; and **Norman R. Whittall,** president of Canadian Collieries Ltd., succeeding **J. B. Beatty,** formerly chairman of the board, **C. W. Nichols** and **W. C. Bennett.**

C. D. King has been named assistant to the executive vice president-operations of United States Steel Corp.

Dr. Raymond Wynkoop has been named manager of the general engineering department of International Minerals & Chemical Corp.'s engineering division.

John J. Craig, iron ore beneficiation authority, has been retained as iron ore and steel consultant for the iron ore interests of Cyrus Eaton of Cleveland, Ohio.



How Anaconda gets High Roasting Efficiency with a FluoSolids* System

For sponge iron production at Anaconda, Montana, Anaconda Company needed a calcine containing less than 1% sulfur. Their conventional fixed bed pyrite roasters, producing gas for an acid plant, delivered a calcine averaging 2 to 6% sulfur. The problem was solved by installing a Dorrco FluoSolids System for an additional roasting stage.

Unique in this installation is the fact that roasting is carried out autogenously on pyrite containing as little as 2% sulfur. Only outside fuel required is for starting up the System. What's more, with sulfur in the feed all the way from 1 to 9%, calcine from the FluoSolids System consistently contains 0.8 to 0.9% S. The FluoSolids Reactor has an inside diameter of 10′ and handles 200 TPD at 1200°F.

High roasting efficiency is just one of the many advantages of fluidization. If you'd like more information on the Dorrco FluoSolids System, the most significant advance in roasting techniques in the last 30 years, just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

*Trade-Mark Reg. U. S. Pat. Off.

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PERSONALS (*Continued*)

HENRY L. HILL, Vancouver consulting engineer, has been elected president of the British Columbia and Yukon Chamber of Mines, succeeding Stanley J. Crocker. Committee members are: Mr. Crocker, Andrew Baird, Gordon Lee, and H. E. Doelle.

Edmund J. Flynn has been named assistant labor advisor for western mining divisions of Kennecott Copper Corp.

John Gray, mine superintendent of Castle Dome Copper Co., Inc., since 1952, has been named general superintendent of Miami Copper Co. and Copper Cities Mining Co., succeeding **Jack Still** who resigned. **Maynard M. Stever** has been named mine superintendent of Copper Cities.

Neil O. Johnson has been named plant manager of Foote Mineral Co.'s Kings Mountain, N. C., mining operation. Prior to his appointment, he had been employed since 1939 as technical representative, explosives department of E. I. du Pont de Nemours.

R. B. Fuller has been named special consultant to the Phosphate Minerals division of International Minerals & Chemical Corp. Since 1953, he has been assistant to the vice president in charge of the division, and has been with International nearly 30 years.

R. G. Altizer has been named assistant to the president of Magnus Metal Corp., subsidiary of National Lead Co. He joined the company in 1949.

John W. Brown, vice president in charge of sales, National Gypsum Co., has been elected senior vice president in charge of marketing, and a director of the company. **Wade W. Hildinger,** former director of general sales, succeeds Mr. Brown.

Robert A. Oberfell has been named assistant secretary of the New Jersey Zinc Co. He joined the company in 1947.

Harold L. Grant has been named vice president and chief of mining engineering and geology for Balcones Corp. Exploration and Drilling.

Clyde E. Osborn, superintendent of the Kerr-McGee uranium mill at Shiprock, has resigned to become associated with a uranium firm. **M. F. Bolton** will be in charge at Shiprock until a new superintendent is named.

William B. Towner has been named general production manager of Foote Mineral Co., responsible for the company's three producing units at Exton, Pa., Sunbright, Va., and Kings Mountain, N. C. He was formerly Exton plant manager.

E. C. Roper, manager of Britannia Mining & Smelting Co., Ltd., has been elected executive vice president of Howe Sound Co. and has been transferred to the New York office. He will supervise all Howe Sound Co. and and subsidiary operations in the U. S., Canada and Mexico. **George C. Lipsey,** manager of the Snow Lake division of the company has been named vice president and a director of Britannia Mining & Smelting Co., and general manager of Canadian operations of the Britannia Co. **G. C. Durham** has been named general superintendent of the Snow Lake division.

W. J. F. Francis, general sales manager, has been named vice president in charge of sales for American Potash & Chemical Corp.

L. P. Davidson has been promoted to manager of the electrolytic division of American Zinc, Lead & Smelting Co., operations at Monsanto, Ill. **Thomas I. Moore** has been named general superintendent of the division.

H. W. Poole, assistant superintendent and operating superintendent since 1950, has been named superintendent of the Sullivan Concentrator in Kimberly, of the Consolidated Mining & Smelting Co., succeeding **A. G. Robertson,** who is Cominco's superintendent of concentration for all the company's mills and concentrators.

William R. Brudenell Foster, director of Enfield Rolling Mills, Ltd. and Siamese Tin Syndicate, has been named a member of the board of directors of Mount Isa Mines, Ltd., London.

Bernard L. Jones has been named to the newly-created post of chief engineer for Crucible Steel Co. of America, and **Tore Wallin** has been named assistant chief engineer.

Howard W. Miller, assistant superintendent, has been appointed superintendent of the zinc mining operations of New Jersey Zinc Co. at Jefferson City, Tenn. He joined New Jersey Zinc in 1946 as a geologist.

Myron C. Taylor, formerly chairman of the board and chief executive officer, retired recently as a director of United States Steel Corp. He has served continuously for more than 30 years as director and member of the finance committee of the corporation.

Florian E. Davatz of Kern Instruments, Inc., White Plains, N. Y., has been elected president of the New York Metropolitan Section of the American Society of Photogrammetry. At the technical meeting, Feb. 21, application of aerial photography and mapping methods was discussed.

OBITUARIES

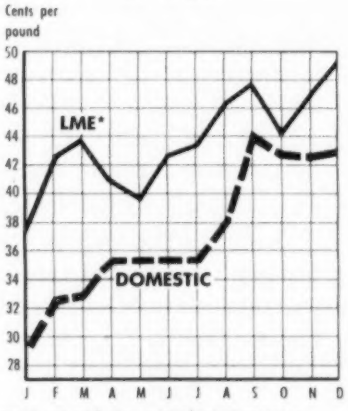
Dr. William E. Cockfield, 65, in charge of the British Columbia office of the Geological Survey of Canada, died January 4 in Vancouver.

Lloyd A. Thorsen, 37, of the mining engineering department of Oliver Iron Mining Division, died suddenly January 17 at his home in Duluth, Minn.

Jules R. Wemlinger, 82, president of Beryllium Mining Co., Gunnison, Colo., died December 16 of a heart ailment at Lake Hopatcong, N. J., while on a holiday visit with his children.

Sherman W. Johnson, president of Utah Bit & Steel, Inc., and a member of the AIME, died September 14 in Dallas, Tex., following a heart attack. He was one of the first directors of the Perlite Institute, which he helped to establish, and for many years contributed articles on perlite to *Engineering & Mining Journal*.

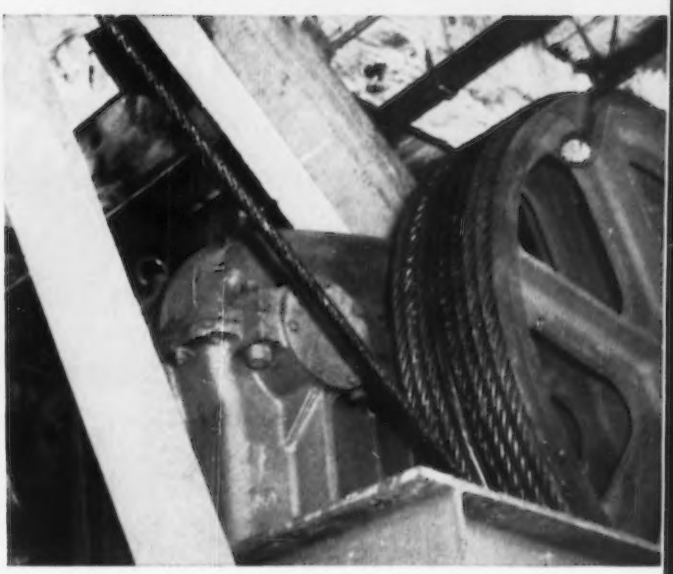
Copper Price Comparison in 1955



*London Metal Exchange price for prompt copper converted to cents per pound.

CHART of copper price comparison which appeared in *E&MJ* February 1956 p 82 gave an incorrect picture of the domestic price and that quoted by London Metal Exchange. Above chart is correct.

EXTRA FLEXIBILITY—Wire rope encounters fast sheave action, reverse bending, constant stop-and-start operation on many jobs. When this same rope must also lift or pull heavy loads, an unusually flexible, strong wire rope is needed.



Rope jobs like paver skip hoists, overhead cranes, large shovel and dragline hoists, and sawmill carriages demand these qualities. That's where the use of 6 x 37 Red-Strand wire rope saves time and money.

Where will 6x37 Red-Strand improve your wire rope service?

Look at a cross section of 6 x 37 wire rope. You see three rings of small, uniformly sized wires in each strand. This differs from a rope construction like 6 x 19, which contains fewer and larger wires.

The *smaller size* wires make 6 x 37 more *flexible*. The *larger number* of wires maintains rope *strength*.

Would this combination improve your wire rope service? Would it solve a problem for you?

Check with your Leschen man. He can help you.

Leschen's 64-page Wire Rope Handbook tells you all about 6 x 37 and other Red-Strand wire rope constructions. Ask or send for your free copy.

6 x 37

6 x 19

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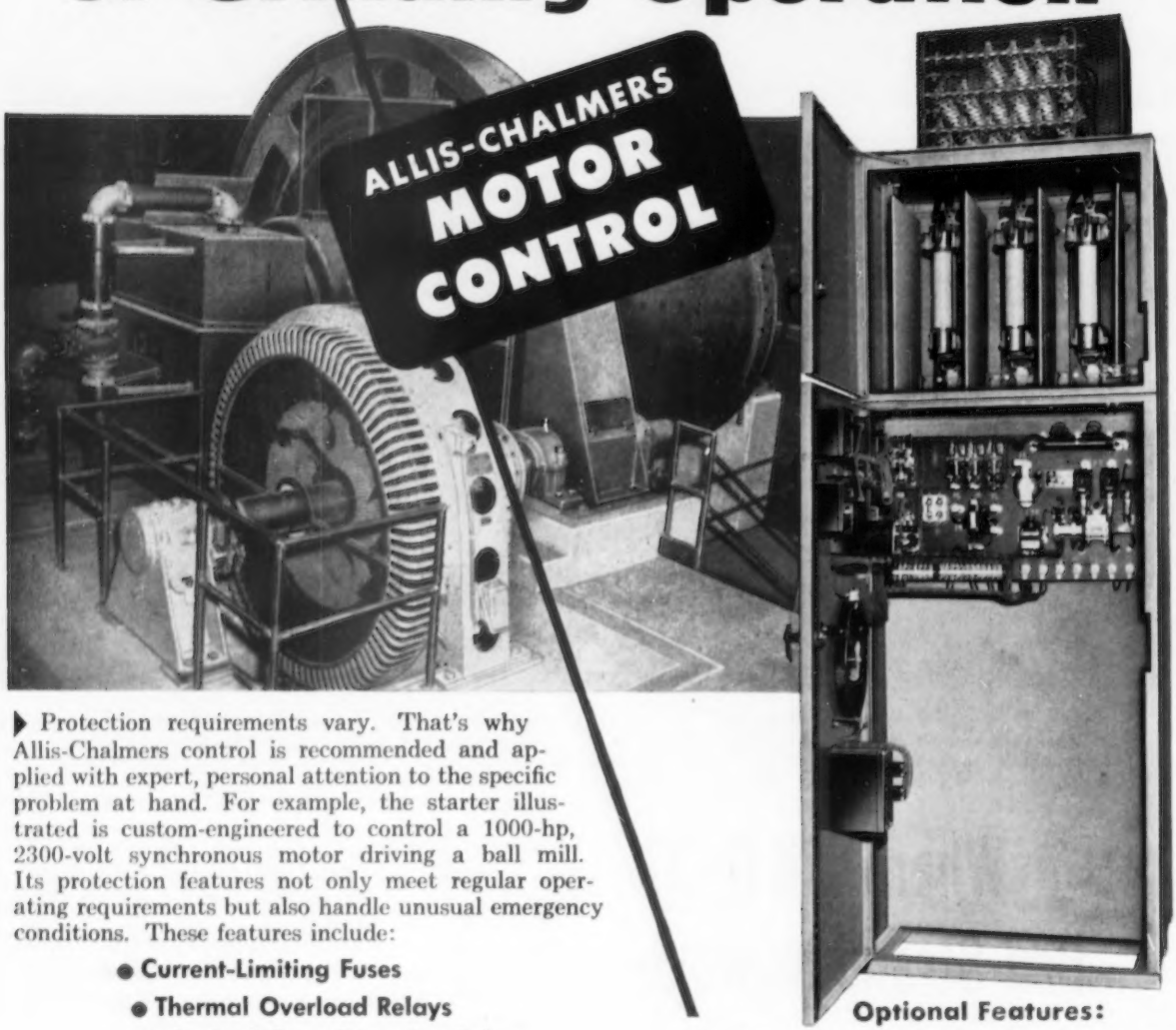
Protection
Under ALL CONDITIONS of Grinding Operation



▶ Protection requirements vary. That's why Allis-Chalmers control is recommended and applied with expert, personal attention to the specific problem at hand. For example, the starter illustrated is custom-engineered to control a 1000-hp, 2300-volt synchronous motor driving a ball mill. Its protection features not only meet regular operating requirements but also handle unusual emergency conditions. These features include:

- **Current-Limiting Fuses**
- **Thermal Overload Relays**
- **Squirrel-Cage Protective Relay**
- **Time-Delay Undervoltage Relay**
- **Polarized Field Application Relay**

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Optional Features:

Exciter voltage relay to prevent starting when excitation voltage is not available; dc field failure relay to shut down motor on field current failure; instantaneous phase reversal and open phase; inching control for positioning mill.

A-4703

A-C ALLIS-CHALMERS

After the Great Ford Foundation Gift . . .

What Still Remains To Be Done To Provide Decent Faculty Pay

The Ford Foundation's gift of a half billion dollars to our privately supported colleges, medical schools and hospitals, now being distributed, is magnificent. But it will be much more magnificent if it inspires completion of the job to which it gives a lift. So far as the colleges and universities are concerned, this job is primarily to rescue their faculty members from being second-class citizens economically.

Even in a period when we have become accustomed to astronomical financial figures, a half billion dollars remains an eye-popping gift. In fact, it is so imposing that a good many people who don't read the fine print are apt to conclude that it must just about solve the financial problem to which it is addressed.

Goes Only a Small Way

However, we have allowed college professors to fall so far behind the parade financially that the share of the Ford half billion dollar gift going directly to the improvement of faculty salaries ($210 million) will go only a small way financially toward doing what is necessary to provide adequate salaries.

Completion of this job for our privately supported colleges and universities calls for:

1. An increase in faculty salaries at least five times as great as that made possible by the Ford gift merely to restore salaries to their 1939 purchasing power level and an increase fifteen times as great to provide adequate salaries today.

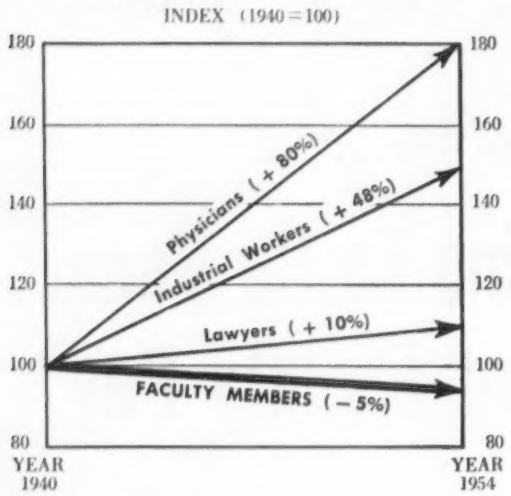
2. Some difficult and courageous decisions by the heads of the colleges and universities in apportioning the grants received by them.

Terms of Gifts to Colleges

The $210 million of the Ford Foundation gift going specifically to improve faculty salaries is being distributed on the following basis: Each of 615 privately supported, regionally accredited liberal arts and science colleges and universities receives a gift about equivalent to its last year's teaching payroll. For ten years only the income from these gifts is to be devoted to raising faculty salaries. After that all the money can be spent in any way the institutions receiving it see fit. There is no requirement that universities having other than liberal arts and science schools limit use of the gifts to improving salaries in these schools alone. They can spread it right through all their faculties if they wish.

In addition to the gift of $210 million specifically directed to increasing faculty salaries, another gift of $50 million goes to a group of 126 institutions selected for specially noteworthy leadership in improving

What's Happened to College Faculty Salaries*



* Real Income before Taxes.

Source: Council for Financial Aid to Education, U. S. Dep't of Commerce: U. S. Dep't of Labor.

the status and pay of teachers. For these schools the individual gifts add about 50% more to the amounts coming from the $210 million fund. They can be used to improve faculty salaries if the institutions choose to do so, but this is not required by the terms of these gifts.

The $210 million plus the $50 million should yield an income of $10-$13 million a year. Even if all this is used to raise salaries, it will be only a small step, however worthy, toward the $200 million per year the colleges need to meet their salary requirements adequately.

Helps Some Who Need It Most

In focussing its gift to improve faculty salaries in privately supported liberal arts and science colleges, the Ford Foundation aims at least part of the help at the spot where it is most desperately needed. Numerous surveys have indicated that the most poorly paid of all college and university faculty members are those in small, privately endowed liberal arts colleges.

But the overshadowing fact is that the teachers in our colleges and universities as a whole are badly underpaid. Just how badly is indicated by the chart above which first appeared in an earlier editorial. (Figures later than those for 1954 are not available.)

The Ford gift will turn the indicator of faculty salaries, which now lies far below the general salary trend, upward a few points. And it will do this in some places where salaries are below the wretched average shown by the chart.

But the Crucial Test Remains

College and university administrators will have the opportunity to extend further the process of getting the help provided by the Ford Foundation gifts where it is most needed. In general, this will mean giving it to senior faculty members, in order to hold experienced teachers and make college teaching attractive as a career. But to make such a division in many schools will take extraordinary fortitude.

The crucial test of the success of the enterprise of the Ford Foundation in raising faculty salaries will lie in whether it prompts the rest of us — college alumni, individuals, business firms and legislators alike — to see that it is a great beginning, not a signal for a recess.

Even with the Ford gifts providing $10-13 million a year, our privately supported colleges and universities must have an increase of about $190 million a year to provide decent faculty salaries.

This is a job far beyond the capacity of the Ford Foundation, imposing though that is. It is a job far beyond the capacities of a few hundred large corporations and a few thousand wealthy individuals. If it is to be done, it is a job at which all of us must work with a will.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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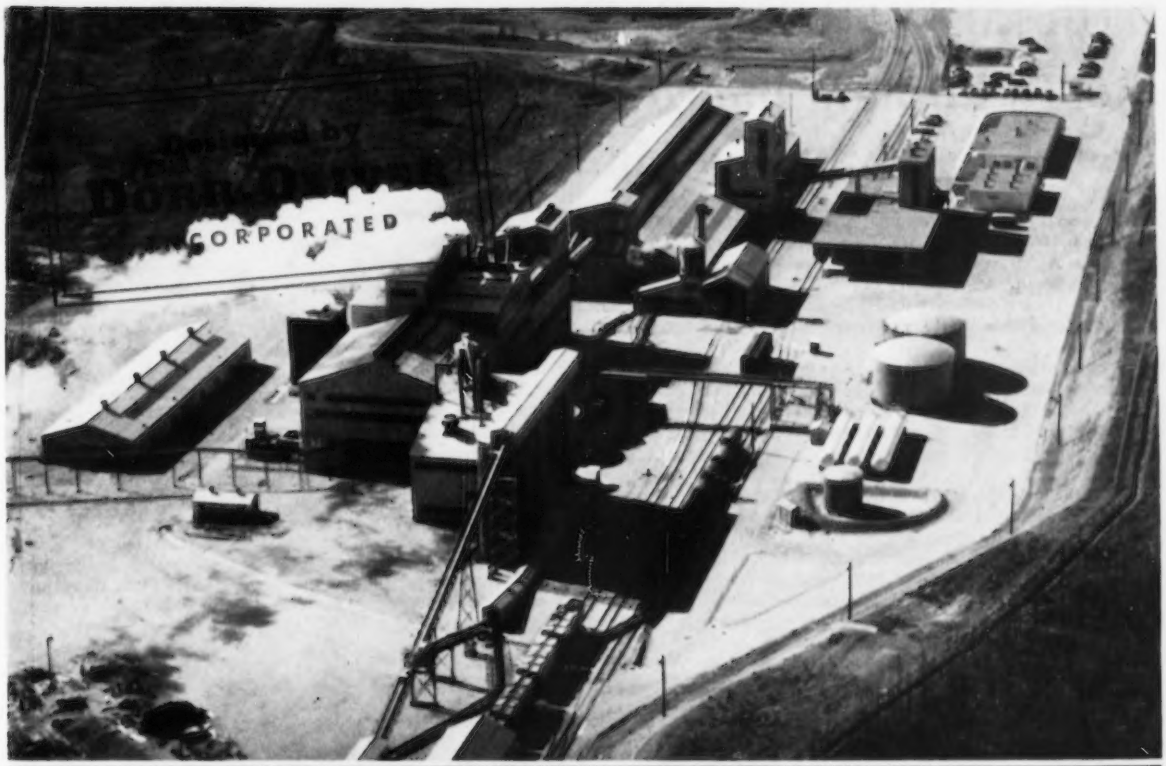

New MFA Concentrated* Fertilizer Plant Now On Stream...

***Based on diammonium phosphate**

Missouri Farmers Association, one of the nation's largest farm cooperatives, is now producing 200 tons per day of high analysis fertilizers at this new plant near Joplin, Mo. First to produce complete granular fertilizers for its members, MFA selected Dorr-Oliver as architects-engineers for this new project. And D-O engineers delivered by bringing the plant into full production just a little over three months after the first raw materials left the feeder bins!

Using the Dorrco Continuous Granular Fertilizer Process, the plant produces a variety of complete mixtures, all based on diammonium phosphate. Included are 14-14-14, 14-28-14 . . . and 12-36-12, the highest analysis complete fertilizer ever produced for general farm use.

If you are considering entering the fast-growing chemical fertilizer field — or if you plan to expand present facilities — it will pay to check with Dorr-Oliver.

Free flowing granules . . . important characteristic of high analysis chemical fertilizers produced by Dorr-Oliver designed plants.

Write for Bulletin #8000, or better still, let us send an engineer to discuss your problem from the standpoint of economics and process. No obligation, of course.

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 (Continued from p 73)

Gold's Position Improved in Volume and Strength in 1955

THE YEAR 1955 saw volume of gold trading in free markets rise 18% and reach the highest rate of turnover in six years, according to Franz Pick, internationally known monetary authority and publisher of Pick's World Currency Report.*

In comparison with the previous year, Pick notes that sales were $1,275-million in 1955, $1,075-million in 1954. Bar gold prices in 1955 lost from one-quarter to one-half of a percent in West Europe's transit markets; dropped 5% in Chile; 11% in Buenos Aires and 14% in La Paz; remained unchanged in Macao, Mexico City, Milan and Tangier; rose in Paris, Tel Aviv, Bombay and Karachi, Istanbul, Rio de Janeiro, Bangkok, Shanghai and Warsaw. Most notable increases were for the latter two markets; 18½ and 25½% respectively.

Coins, in better demand than in 1954, gained an average of 2¾% in most trading centers during the year. Price of minted gold, about $39 per oz a year ago, was listed at $40.70 at year end in leading markets. Value of gold sales in international markets were listed by Pick as follows: (in millions of U.S. dollars)

Jan.	$85	**July**	$110
Feb.	75	**Aug.**	95
March	85	**Sept.**	105
April	105	**Oct.**	155
May	100	**Nov.**	85
June	165	**Dec.**	110

Principal events of 1955, according to the New York publisher, included easing of gold legislation during the year; less supervision of private trading in West Europe; volume activity on the London market; and announcement that Belgium would re-open her gold market (Jan. 2, 1956). In southeast Asia, large quantities were absorbed and Red China's dealers were constant buyers of gold in Saigon, Rangoon, Singapore and Hong Kong. Japan's trading was quiet; gold became freer in Argentina and "Rio tolerated it," with Montevideo's dealers providing the coins and bars for Buenos Aires and Rio.

Soviet Russia shipped more than 4-million oz gold to the West, says Pick, with principal sales in London and Zurich. In 1954, USSR shipped about 3-million oz. All Russian shipments served to acquire Sterling and dollars for payments for imports from the Sterling Area and of Cuban sugar.

U. S. gold stocks remained practically unchanged (about $21.7-billion); the American gold position underwent only minor changes during the year.

A triumph for gold is seen in its use as "the measuring rod of currency quality" during 1955. Says Mr. Pick, "Since Aug. 1, monthly settlements of the European Payment Union have had to be made at 75% of the monthly trade debt in U. S. dollars or in gold, the latter valued at $35 an oz. As these monthly settlements run into many millions of dollars, every small percentage counts. The U. S. gold price, having too wide a span, has become unattractive for such EPU settlements, as the shipping and insurance expenses of about $0.16 per oz would extend the spread to about $34.75 buying and $35.26 selling.

"Therefore, London's market, with a spread of not more than $0.03, makes it the only practical trading center for such settlements. As London's gold price has remained below $35 for many months, Britain got all the settlement business from London and Paris and Swiss brokers. Furthermore, EPU gold can be deposited in London, which eliminates shipping expenses from there to the Continent.

"Gold," says Pick, "is making a legal comeback."

Continued extra-governmental gold trading in all parts of the world (with the exception of the U. S.) is seen for 1956. Russian gold shipments will most probably be resumed, "but will not bring new declines in price. Western European trading will increase. Southern Europe, North Africa, the Near and Middle East, as well as Red China, will continue to import coins. Hoarding, which declined somewhat in 1955, might again shrink in minor proportions in 1956, but will certainly not disappear.

"The fact that at least ten or more legal devaluations will occur during the coming 12 months," says Pick, "perpetuates the demand for the metal in any form."

* New York 6, N.Y. Pick's Currency Yearbook, price $35.

UNIQUE CASTING WHEEL contains fabricated steel tube, water-jacketed billet molds and internally water-cooled refined copper cake molds. New versatility is gained.

Kennecott's Casting Wheel Sets a New Pace

UTAH COPPER DIVISION, Kennecott Copper Corp., is claiming several "firsts" in development of its huge vertical casting wheel now being installed in firm's Garfield electrolytic plant.

Officials say they are "continuing Kennecott's policy of bold use of latest engineering and metallurgical advance" in this field—an advance which started with exclusive use of electric arc furnaces at the refinery a few years ago.

Most significant feature of the new vertical casting department for cakes and billets is the radical wheel design. In this wheel, both fabricated steel tube, water-jacketed billet molds and internally water-cooled refined copper cake molds are all located in concentric casting rings on a single casting device.

"This simultaneous arrangement is designed to permit quick change of production from one VC shape to another, to minimize mold changing and to eliminate construction of another wheel," the copper firm reported.

"To serve this arrangement, it was necessary to design new types of ladles, pouring equipment and take-off equipment. Another 'first' is installation of spray chambers for cooling the hot shapes rather than use of conventional immersion quenching procedures," refinery officials said.

The spray method, by eliminating the

Again in '55...

MACK

1st* IN DIESEL TRUCK SALES

and by the biggest margin ever!

* based on official A.M.A. factory sales figures. Nearest make attained 17.16% of the market.

42.06% of all diesel trucks sold in 1955 were MACKS!

Operators everywhere, in all kinds of hauling operations, have again made Mack their No. 1 favorite among *all* diesel trucks. And their margin of preference is the biggest so far! Regardless of competitive claims, Mack owners have learned from millions of miles of heavy-duty operation how truly outstanding are Mack trucks powered by the famous Mack Thermodyne Diesel engine. They're *first* in earning power . . . because they're *first* in fuel economy, *first* in low-cost maintenance, and *first* in rugged long life. See your Mack branch or distributor for the full story. Mack Trucks, Empire State Building, New York 1, New York.

MACK

first name for

TRUCKS

3961-A

insulating steam layer formed when a hot casting is immersed, should give more efficient heat transfer and faster cooling.

An Ajax induction furnace of standard horizontal type has been installed in the VC department to provide heat control on copper carried in molten state from the electric arc furnaces.

Cakes weighing up to 4,000 lb and billets from 3 to 9 in. in dia. will be produced from the new wheel.

Utah Copper's output currently is confined to wire bars and ingots.

Through addition of billet and cake casting a higher degree of flexibility in meeting market demand will be effected with resultant greater stability of operations.

St. Joseph Lead Adds Power

A $16-MILLION power plant will be built at Josephtown, Pa., site of St. Joseph Lead Co.'s zinc smelter on the Ohio River; construction by Kaiser Engineers division of the Henry J. Kaiser Co. Plant, with capacity of 100,000 kw, is to be completed in about two years.

Ferromanganese for India

TATAS, important Indian iron and steel firm, will construct a $4-million ferromanganese plant in the mining area of Joda, Orissa, in east India. Initial capacity is planned at 30,000 tons standard ferromanganese per year, with two electric rotating furnaces to be provided by a Norwegian firm.

National Lead Expands Tahawus Mine Output

NATIONAL LEAD CO. will expand capacity at the mine and mill at Tahawus, N. Y. by some 25% within the year. Titanium-bearing ilmenite is mined at the site, where a previously undiscovered orebody was found last year. New orebody will extend life and volume of production at the plant.

Expansion includes adding a fifth production line to the mill and addition of another mining shift. Concentrates from the property are sent to the firm's titanium pigment plants which are located in Sayreville, N.J.

DMEA Executes Seven Pacts

SEVEN NEW CONTRACTS were signed in December 1955 by Defense Minerals Exploration Administration, with a total cost of $61,078 and a Government share of $41,466. Twelve other contracts have been approved by DMEA but not yet executed by the applicants.

Scholarship for "Mines" Men

ALUMNI of the Colorado School of Mines are elegible for a mineral engineering fellowship at Harvard Business School if they have at least two years full-time or part-time industry experience. Fellowship carries a stipend of $1,500 per academic year for each of two years, according to a recent announcement by the school.

Scholarship Fund Set Up by Longyear Memorial Fund

A SCHOLARSHIP FUND at the University of Minnesota has been set up through the Edmund J. Longyear Memorial Fund to provide scholarship and fellowship assistance to qualified graduate and undergraduate students in obtaining training in mining and metallurgical engineering, geology and other basic earth sciences.

The $3,400 fund will support one or more scholarships for the year 1956-57, with the intent that the E. J. Longyear Co. will support the scholarship annually.

Zinc Institute Meeting Set

AMERICAN ZINC INSTITUTE has announced that the 38th annual meeting of the organization will be held at the Hotel Statler, St. Louis, Mo., April 23-24.

Program for Monday, the first day, includes reports on the general outlook for 1956; outlook for zinc and zinc-coated steel, zinc pigments and zinc in cathodic protection, and zinc market developments in the U.S. and Europe.

The second day's schedule will feature supplies and requirements, mining, creating new markets and Washington observations.

(*Continued on p 132*)

Nothing drills like a
SPANG
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Performance Records show...
● More Footage
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It doesn't take drillers long to recognize a good thing. Look around you at the record breaking number of Spang Bits being used... convinced? ... then go SPANG TODAY!
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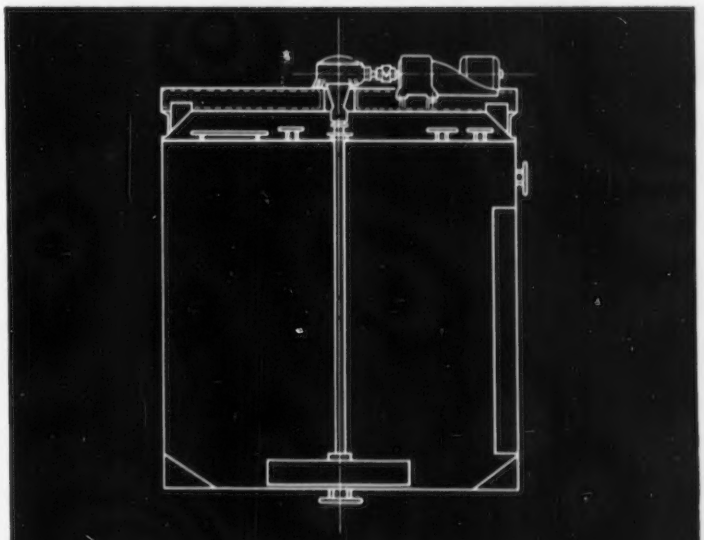
Turbo-Topics

TURBO-MIXER GENERAL AMERICAN TRADE MARK

TURBO-MIXER, a division of
GENERAL AMERICAN TRANSPORTATION CORPORATION

from laboratory to pilot plant to production, you can rely on TURBO-MIXERS



Simplex Turbo-Mixer Design

Leaching titanium sponge is no easy job—not for ordinary mixers. Competitive mixers tried in pilot tests were unsatisfactory. Turbo engineers were called in—and following tests at our laboratory, a workable design was created. The design was verified with a Turbo-Mixer in the customer's pilot plant. Then, the customer asked if we could set up a full scale unit at our shop and test it under actual plant conditions with a full charge of titanium sponge. We could! We did!

Seven large Turbo-Mixers are being installed to leach titanium sponge for another satisfied Turbo customer. A Turbo engineer is available to work with your men in solving difficult engineering problems. Use his services . . . there's no obligation. **It pays to plan with General American.**

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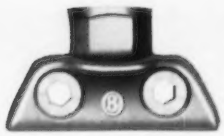
INSULATED HANGERS

1

HANGER ADAPTERS

2



TROLLEY WIRE CLAMPS

3

FEEDER SLINGS

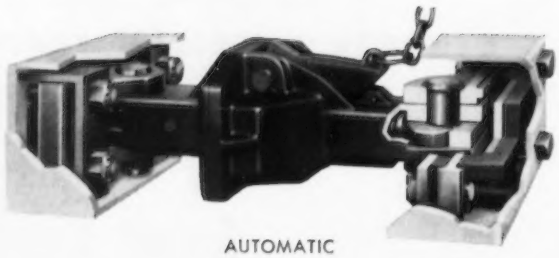
4

TROLLEY FROGS, CROSSOVERS

9

EXPANSION BOLTS

10



AUTOMATIC COUPLERS

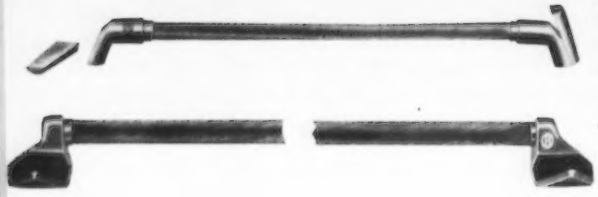
11

Ohio Brass - First in

LOCOMOTIVE EQUIPMENT

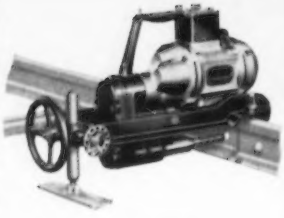
LINE MATERIALS

RAIL BONDS



RAIL BONDS

15



RAIL DRILLS
(for wedge bonding)

16

BOND WELDING EQUIPMENT

17

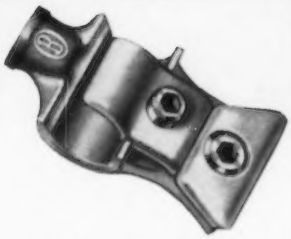
WHEEL COLLECTORS

18

TROLLEY WIRE CONDITIONING EQUIPMENT

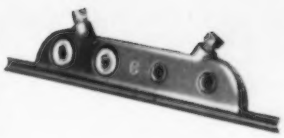
20

FUSED TAPS



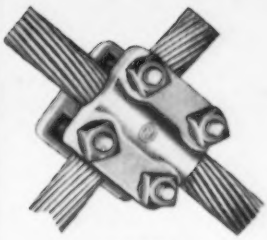
COMBINATION FEEDER-TROLLEY CLAMPS

5



FEEDER AND TROLLEY SPLICERS

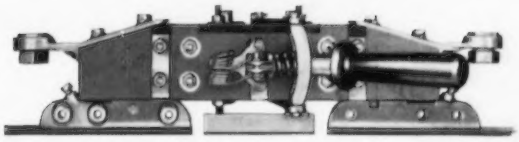
6



BRANCH CONNECTORS

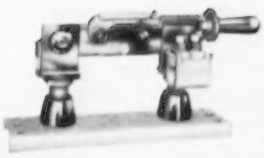
7

PORCELAIN INSULATORS



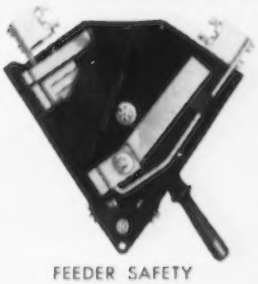
SECTION INSULATOR SWITCHES

12



QUICK-BREAK SWITCHES

13



FEEDER SAFETY SWITCHES
(cover removed)

Mine Haulage!

Ohio Brass is one of the world's largest suppliers of electrified mine haulage equipment — has been since before the turn of the century. That's why you can bring your mine haulage problem to O-B engineers and be sure of an efficient, economical solution—whether it's simply a recommendation for a new insulated hanger or a blueprint for a complete haulage system.

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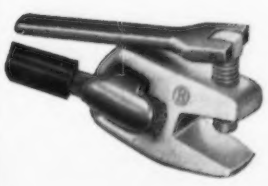
SHOE COLLECTORS

18



RAIL CLAMPS

22

Let O-B mining engineers help solve your mine haulage problems. Just circle the appropriate number and clip the coupon for information about these products and how to use them.

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☐ **A Storehouse of Ideas** — O-B Mining and Industrial Catalog No. 27 is loaded with suggestions for more efficient haulage. Check the box to get your copy.

☐ **A Library of Information** — O-B Haulage Ways brings 8,000 mining men "how-to-do-it" articles and new product information every month. Just check the box to add your name to the list.

☐ **Aluminum Feeder Cable** — Supplement No. 1 to the O-B No. 27 Catalog lists O-B fittings for aluminum cable and describes correct installation procedures. Check box for your copy.

4707-M

IN THE U. S.

ALASKA

A second uranium deal has been made on a property in the vicinity of Bokan Mountain, Prince of Wales Island. Uranium Carbide Nuclear Co. of Grand Junction, Colo., has signed a contract with Mr. and Mrs. Les Hollenbeak of Ketchikan on the I & L property, which adjoins the original Ross-Adams discovery where Climax Moly is now working.

Estimated mineral production for 1955 is included in a recent report by the Territory USBM station at Juneau. Figures are for short tons except where noted. 1955 figures are estimates.

	1955	1954
Chromite	7,067	2,953
Copper (recoverable)	—	4
Gold (recoverable) in troy oz	247,535	248,511
Mercury (76-lb flasks)	—	1,046
Silver (recoverable) in troy oz	33,864	33,697
Tin (ore & conc.) in long tons	85	199

United States Bureau of Mines, Territory of Alaska, U. S. Department of the Interior.

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from 100 POUNDS/hour to 100 TONS/hour are suspended from the feed bin which:

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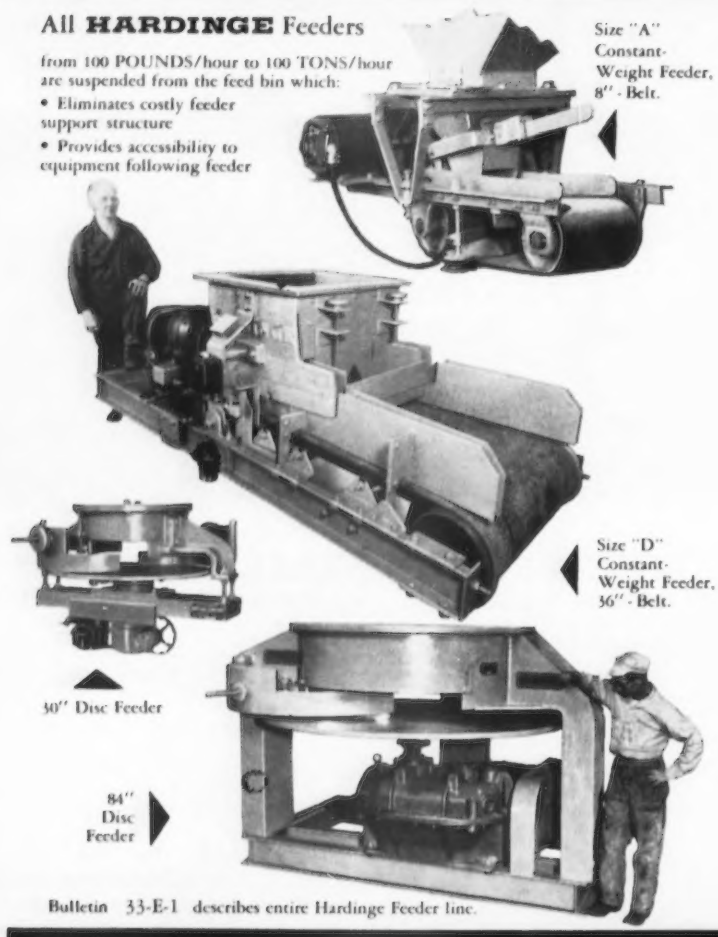

Bulletin 33-E-1 describes entire Hardinge Feeder line.

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ARIZONA

A 10-year option to purchase two copper mine prospects near Superior has been concluded between Anaconda Co. and stockholders of the Bellemont and Queen Copper firms. Sale price of the Bellemont was set at $800,000 and for the Queen Creek $400,000.

Under sale negotiation are two adjoining properties, the Grand Pacific and Magma-Superior.

All of the properties are located just south of Magma Copper Co.'s producing mine at Superior.

The properties cover an area of 3.5 square miles.

Surveys indicate that whatever ore is present is of the vein type and will require deep mining techniques.

Eleven companies agreed to pay a total of $170,946 for uranium exploration rights on 26 tracts of Navajo reservation land at public bidding conducted at the Window Rock agency in January.

Tracts involved total 13,744 acres, in the Monument Valley area along the Arizona-Utah border.

Successful bidders included Federal Uranium Corp., Gibraltar Minerals Co., Rare Metals Corp., New-Shat-Tex Corp., Phillips Petroleum Co., Utomic Exploration and Mining Co., Bryden Mines, Inc., Continental Oil Co. and Newmont Exploration Ltd. (one tract), Copper Canyon Mining Industries, Reynolds Electrical Corp., Treasure Uranium and Resources Inc. (one tract).

Big spender was New-Shat-Tex Corp., which bid a total of $64,950 on six tracts covering 3,165 acres.

CALIFORNIA

Verdi Development Co.'s uranium mill at Soledad Mountain near Mojave, Kern County, is making continued progress toward production of a commercial grade of sodium uranate U_3O_8, according to E. H. Andrews, Verdi president. During the initial phase of mill operation, grade of sodium uranate produced was 15%. In January the grade improved to 50%. AEC purchases sodium uranate of a minimum grade of 70% U_3O_8.

In Riverside County, Verdi is continuing development of the Beauty Mountain tungsten property. Forty-seven coreholes at the site of the old Pawnee shaft at Beauty Mountain have indicated an orebody of tungsten measuring 108 ft in depth and ranging from 12 to 35 ft in width.

Atomic Energy Commission is using a Piper super cub, based at Santa Paula, in support of ground investigations for uranium in the area north and west of Ojai, Ventura County. Findings will be issued in the form of a geological report rather than through posting of an anomaly map as was done last spring in Bakersfield, Kern County. The report may be available in early summer of this year. AEC is concentrating on evaluating occurrences in a limited area and applying the results

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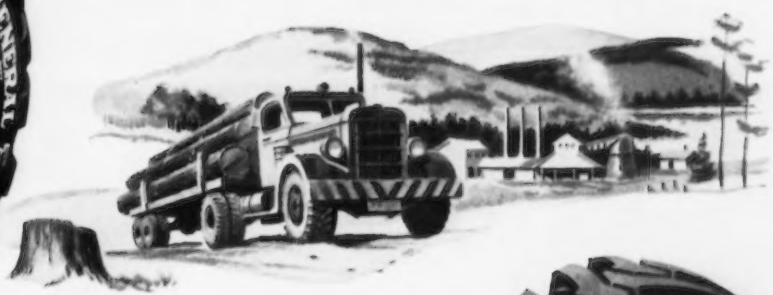

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California *(Continued)*

in a wider area. Numerous occurrences have been reported in the area, with special interest in the contact between the Sespe formation of Oligocene age and the Coldwater formation of Eocene age. Deposits reportedly are somewhat similar to tertiary deposits in Wyoming and the Colorado Plateau areas.

Golconda Metals Development Corp., headed by Sigmund Jonas, Lancaster, purchased the four High Hope uranium claims in the Mojave Desert from Clyde Moore, Robert P. Donovan, and Chris Hansen for $150,000.

National Tungsten Corp., headed by Roy H. Johnston, Los Angeles, president, and E. H. Andrews, Los Angeles, vice president, acquired 640 acres of tungsten claims in the Cedar Creek mining district, Kern County, from M. K. Doumani and Ed Wilder.

COLORADO

Mineral production for Colorado reached an all-time high of $272,764,000 in 1955, exclusive of uranium, according to a preliminary survey by the U. S. Bureau of Mines. Figure includes petroleum.

John H. East Jr., regional director of the bureau of mines, pointed out that total mineral output for the state has set new records for nine consecutive years. The 1955 total was 12% higher than the 1955 figure.

Production figures included:

Gold, 90,200 oz—$3,157,000; silver, 2,800,000 oz—$2,534,000; vanadium, 9,100,000 lb—$9.1-million; lead, 15,850 short tons—$4,723,000; zinc, 35,400 short tons—$8,708,000; tungsten concentrate, 750 short tons—$2.77-million.

Molybdenum again was the individual leader in value among metals. Production of uranium ore and concentrates in 1955 exceeded all previous records and topped figures for fiscal 1954 by almost 50%, the AEC's Grand Junction Operations Office said in its first annual summary report, issued in January.

The report said initial production bonus payments passed the $6-million mark late in 1955, and that $1.8-million was paid out last year. Bonus payments in 1955 exceeded those for 1954 by 15%, the report said.

There were about 1,000 uranium ore producers at the end of the year, and approximately 6,000 persons directly engaged in uranium mining operations in the Western states, the review said.

It added that before 1955, there were only about 10 uranium deposits which had more than 100,000 tons of reserves. About 25 such deposits now are known, the report said, and at least a few have multi-million-ton reserves.

Telluride Mines, Inc., reopened in January after a 20-month shutdown. John Wise, general manager, said payroll for the new operation is about 250, and that the Telluride mill, rebuilt during the shutdown, now has a monthly capacity of 30,000 tons. Company expects to ship 5,000 tons of lead, zinc and copper concentrates monthly.

Telluride Mines is a subsidiary of Idarado Mining Co. Mill expansion was carried out under the direction of A. C. Highlander, mine superintendent for Telluride and Idarado; M. A. Jorgensen, mill superintendent for both companies; G. C. Forbes, chief clerk, and C. C. Chamberlain, chief engineer.

White Canyon Mining Co. reported to stockholders in January the company planned to ship 200 tpd ore during 1956. White Canyon also has 30,000 acres of oil and gas leases, including two wells with commercial production, and manganese property in Arizona.

Prospectors filed at least 850 uranium claims Jan. 18 within a few hours after 31,622 acres of withdrawn lands were restored by the Atomic Energy Commission. Public lands affected included 27,679 acres in Grand County, Utah; 2,720 acres in Mesa County, Colorado, and 920 acres in San Miguel County, Colorado. An additional 303 acres of patented lands also were restored. More than 600 claims were filed at Moab, Utah. County Recorder Esther Somerville said prospectors began arriving at 5.30 am. Two hundred and sixty claims were filed at Grand Junction and others at Telluride.

(Continued on p 138)

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Baker & Adamson offers an important new development in packaging Sulfuric, Hydrochloric and Acetic Acids, and Ammonia: *no-deposit "Single Trip" shipping cases with non-returnable bottles!* This special heavy duty case holds six five-pint bottles . . . eliminates deposits, record keeping, the trouble of making returns.

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The B&A case is made of double strength corrugated fiberboard, with bottles protected by special "cushions." Its tare weight is just 5 pounds, compared to 16 pounds for returnable 9-bottle wood case . . . or just one-half the tare per bottle. In addition, you can store 25% more acid in the same space with this case than with a wood case. The new bottles also weigh less . . . 32 ounces as compared to 42 ounces for returnable bottles.

With this "Single Trip" unit, there are no return freight charges for you to pay, and incoming freight costs are less, too. For most users, the modest increased charge per unit on this case will be more than offset by these direct freight savings as well as by reduced handling and accounting costs.

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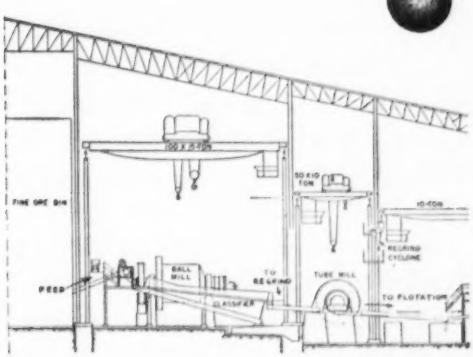

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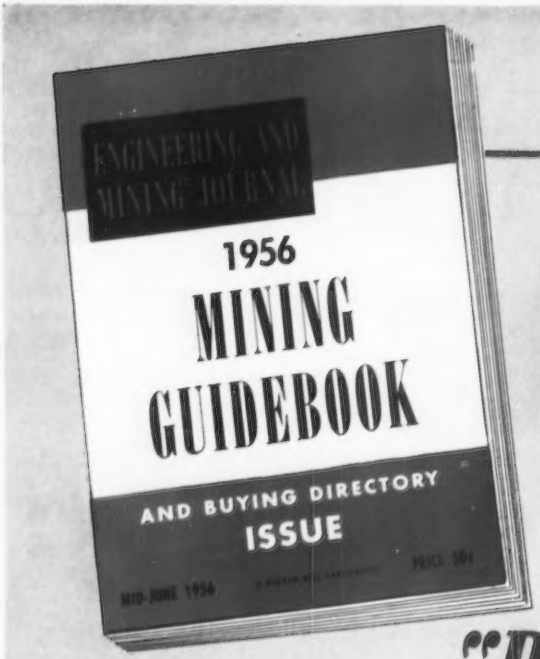

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"Of very good use to us in our planning and development programs." — Argentina

"Brings together a large amount of useful present-day practice." — California

"Information very reliable. Couldn't do without it." — Utah

"This is what is needed for quick reference."— Oklahoma

"Very useful from my point of view for our tungsten mines here." — Bolivia

Colorado *(Continued)*

Contract has been executed by Reynolds Tungsten Corp. and DMEA in which the Government will contribute $56,467.13 in aid for exploration for tungsten in the Dozer mine, Boulder County, near Nederland. Reynolds Tungsten is a wholly owned subsidiary of Reynolds Uranium Corp. The company recently encountered ore in its initial exploration program and is shipping ore regularly to the Cold Spring Tungsten, Inc., mill at Nederland.

Emperius Mining Co. of Creede has contracted with O. W. Walvoord, Inc., of Denver, to rebuild its mill, power plant and other facilities which were destroyed by fire in August 1955.

Atlas Uranium Corp. of Moab, Utah, moved a 100-ton capacity lead-zinc processing mill into Montrose for storage in February. President J. C. Burgess said the mill would be stored there until snow clears in the spring, after which it will be set up on company properties in the Gunnison area.

Announcement of the mill purchase disclosed for the first time that Atlas had acquired lead-zinc property in Gunnison County.

Inland Empire Uranium Corp., a Nevada corporation with offices located in Reno, is starting mining, milling and exploration on its deposits of tungsten in the Lake George and Guffy areas, with its mill located at Salida. Company also owns various holdings of uranium in the Tallahassee mining district, Fremont County, also a large lithium deposit in the vicinity of the well known Brown Derby property, located in Gunnison County. The company also has thorium deposits in the Wet Mountain district of Colorado.

Options on four mining properties have been purchased by General Minerals Corp., S. Y. Guthrie president. General American Oil Co. of Texas is the major stockholder in General Minerals. The properties include uranium lands in Moffat and Fremont counties of Colorado; a copper mine near Cuba, N. M.; a copper-gold-silver producer known as the Summitville mine, purchased from A. E. Reynolds interests, and a gold mine also from Reynolds interests near Ohio City, Colo.

LEFT: *Weighing a car in motion at Seven Islands.* BELOW: *Typical control and printing units at Seaboard's Hamlet yard.*

Weighs 100 cars in 20 minutes "on the fly"

All iron ore from the new Labrador fields—over 6 million tons in 1955—is weighed in motion by these Cox & Stevens electronic track scales. Installed by Iron Ore Company of Canada at Seven Islands, the scales automatically print-weigh a train of 100 cars in just 20 minutes!

After extensive experience, the Company reports: "Fast motion weighing . . . approximately twice as fast . . . accuracy equal to the best . . . maintained over longer periods . . . maintenance costs are low."

Many other modern railroad classification yards are now speeding all types of freight to destination . . . thus making available more cars . . . with accurate electronic motion weighing. The "Electro-Load" scales can be linked with machine tabulating, teletype or other automatic systems, saving time and paper work and preventing human error.

See what Cox & Stevens electronic track scales can do to reduce weighing costs, speed up delivery, and increase customer service.

COX & STEVENS ELECTRONIC SCALES DIV.

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WALLINGFORD, CONNECTICUT A Subsidiary of Neptune Meter Company

IDAHO

Value of Idaho's mineral production declined to $67,040,000 in 1955, from $69,101,000 in the previous year. Principal factor in the decrease was a strike by the International Union of Mine, Mill and Smelter Workers against several major producers in the Coeur d'Alene mining district, which began Aug. 24 and lasted through the end of the year.

Lead production was off 8% to 63,515 tons, the lowest level in nearly 60 years; zinc output dropped 15% to 52,207 tons, the smallest state yield since 1939; and silver production was down 12% to 13,978,990 oz. Mines in the Coeur d'Alene district supplied 95% of the zinc output, 94% of the silver and 93% of the lead. Only important producers of these three metals outside the Coeur d'Alenes were the Triumph Mine in Blaine County and the Clayton Mine in Custer County.

Bunker Hill & Sullivan Mining & Concentrating Co. retained its position as the largest producer of lead, the Star Mine at Burke (now wholly-owned by Bunker Hill) was again the top zinc producer, and Sunshine Mining Co. again led in silver output.

Major gains were recorded in 1955 in copper and cobalt production due to stepped-up operations at Calera Mining Co.'s Blackbird Mine in Lemhi County, and in mercury output due to reactivation of the old Idaho-Almaden Mine in Washington County by Rare Metals Corp., mining subsidiary of El Paso Natural Gas Co.

Hecla Mining Co. has started shaft-sinking at the Silver Mountain Lead Mines' property in the Coeur d'Alene District east of Mullan. Installation of a 225-hp hoist and final power hook-up with the new substation installed by Washington Water Power Co. for the operation were completed late in January. The headframe and surface had been completed earlier.

(Continued on p 140)

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BULLETIN No. B52
Twelve pages of illustrations and descriptions on JOY portable lighting (String-a-lite) and tool-outlet strings.

PORTABLE LIGHTING LINES (String-a-lite) . . . Require no special tools or talents to install or dismantle. Can be quickly lengthened, shortened or moved to meet the exact needs of any working or passage area. Supplied in one-piece factory molded sections of 2 to 10 light outlets that inter-connect through JOY male and female "end-plugs" to make up the complete string. Choice of five socket and two end plug designs. Mating power receptacles also available. Bulletin B52 provides complete details.

BULLETIN No. B48a
Describes and illustrates JOY's complete line of cable vulcanizers, molds and vulcanizing supplies.

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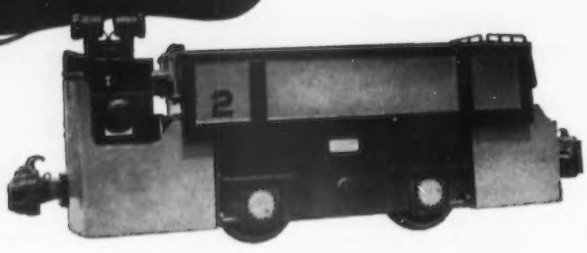

The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

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Idaho *(Continued)*

Sinking operations are on a three-shift, around-the-clock basis.

The project is a joint venture with Bunker Hill & Sullivan Mining & Concentrating Co. and it is being done with the aid of a DMEA loan of more than $500,000. It involves the sinking of a 2,080-ft shaft and some 6,400 ft of lateral exploration, plus extensive diamond drilling, from the bottom shaft level on the 2,000-acre Silver Mountain property.

Sunshine Mining Co.'s production dropped 13% in 1955 to 225,800 tons due to the shorter work-week which was in effect during the year. Total includes tonnages mined from adjoining properties through Sunshine facilities under profit-sharing agreements. Operations at the company's property in the silver belt of the Coeur d'Alene district were on a 40-hour week basis throughout 1955, whereas a 48-hour schedule had been maintained for the first 10 months of the previous year.

Exploration work by Sunshine has opened a new ore shoot in a previously unexplored section of the Silver Syndicate fault-vein structure. An east drift on the 3700-ft level exposed 70 ft of high-grade lead-silver ore ranging from 3 to 9 ft wide and averaging about 28 oz silver and 7% lead per ton.

New ore is in virgin ground with no openings either above or below. Nearest known ore is about 500 ft to the east on the 3100-ft level of the East Rambo area.

Sunshine operates the adjoining Silver Syndicate property under a 50-50 profit-sharing agreement.

Idaho Thorium Co. and Salmon Uranium and Thorium Co., both of Mackay, have sold 175 claims rich in radioactive thorium on the Idaho-Montana border to California interests headed by D. B. Lewis of Los Angeles, head of the Dr. Ross dog-and-cat food company.

Lewis said the new owners plan to develop a mining and milling operation at the property, which straddles the Continental Divide north of Salmon, and they have already been issued a Federal license to sell their production within or outside the U. S.

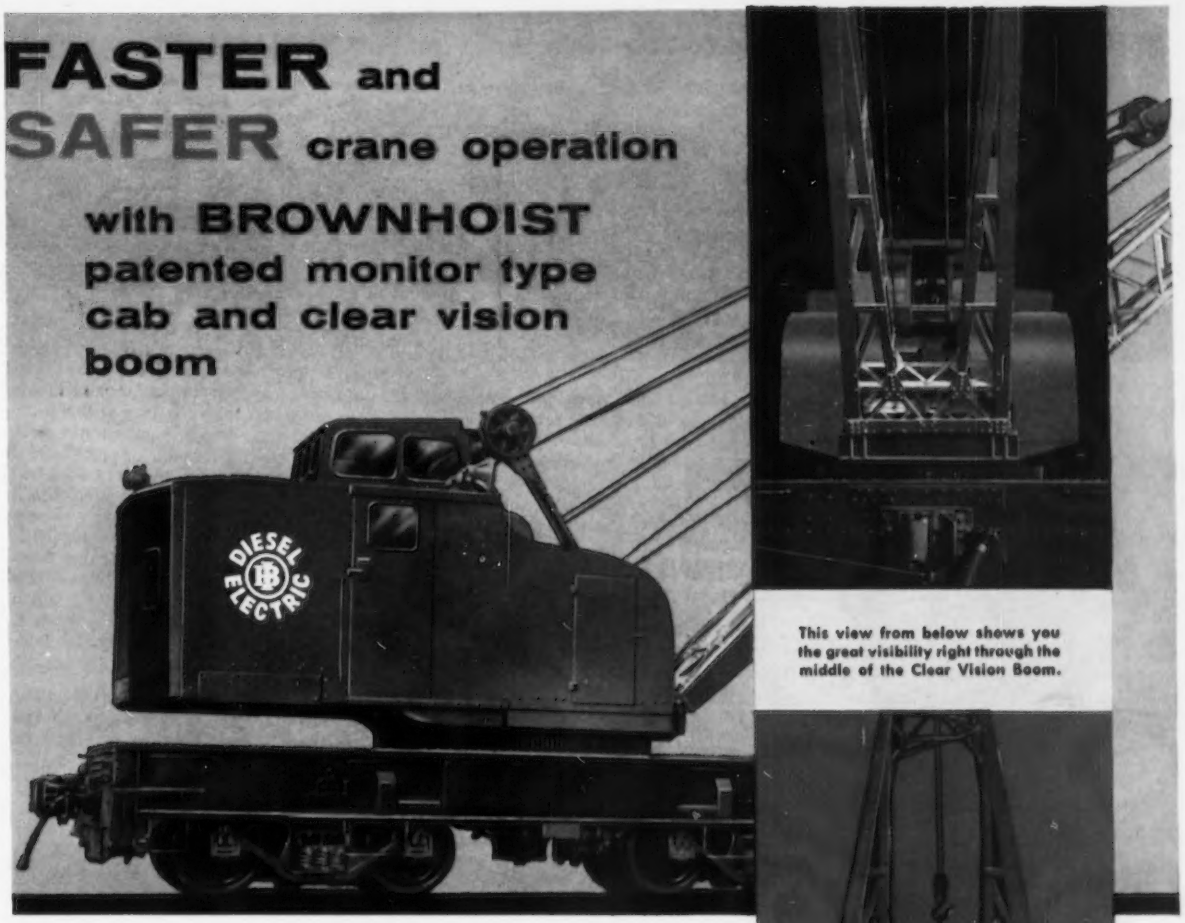
Stauffer Chemical Co. estimates its phosphate rock reserves around Bear Lake at more than 5-million tons.

The firm said that after about 5 years exploration and development work, the high-grade, mineable reserves have proved to be a long term supply for its west coast fertilizer plants at Richmond and Vernon, Calif., Tacoma, Wash., and for Garfield, Utah, operation of Western Phosphates, Inc., an affiliated firm.

The reserves may be "doubled or tripled if the beneficiation of lower grade, secondary beds proves feasible," Stauffer said.

Development work on the beds has been carried out by San Francisco Chemical Co. in collaboration with Stauffer geologists. Work includes a 1400-ft drift extended mining at depth in main Phosphoria beds, a 3,000-ft drift along the main bed and a 1500-ft raise from the

FASTER and SAFER crane operation with BROWNHOIST patented monitor type cab and clear vision boom



This view from below shows you the great visibility right through the middle of the Clear Vision Boom.

Windows on all sides of the raised Monitor Type Cab of a Brownhoist Locomotive Crane give the operator a full view of the area in which he is working, and the open type Clear Vision Boom lets him look right down at the work itself. This complete 360° visibility—to the sides, to the rear, and forward into the car—allows the operator to work more rapidly, without unnecessary crane swinging, and also increases safety by eliminating blind spots. The patented Monitor Type Cab has a door on each side, and all doors and windows can be opened for ventilation. A soundproof partition separates the operator from the engine and controls are placed within convenient reach of his adjustable seat. These factors assure ease of operation of the Brownhoist Locomotive Crane, and Brownhoist engineering assures maximum performance. Anti-friction bearings are used throughout including machinery side frames. The boom hoist is worm driven for smooth, safe operation. Dynamatic clutches disconnect all upperworks when travelling . . . give sure, positive control. High strength alloy steels bulwark the machine for heavy service. Throughout, Brownhoist Locomotive Cranes are designed and built for high capacity production. For further information write today for Catalog No. 548.

Approximate visibility from ordinary cab.

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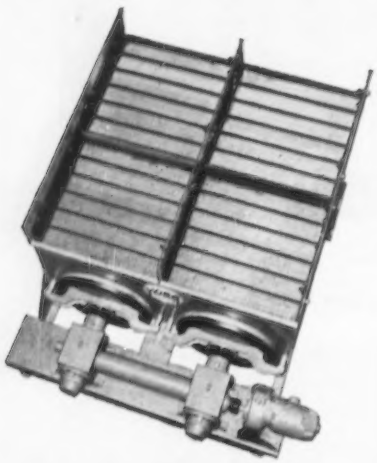

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Idaho *(Continued)*

adit and drift to surface elevation above the deposit. The adit has been completed and the entire development project costing an estimated $400,000 should be finished by end of 1956.

Anaconda Co. will cease underground mining of phosphate rock at Conda on April 1, according to L. E. Traeger, mine superintendent.

The firm, which ships the rock to Anaconda, Mont., for conversion into triple superphosphates, has been engaged in underground operations at Conda since 1920.

Traeger said open pit mining would continue at company properties. The underground mine is being closed because of continually increasing costs of operations, he said.

MINNESOTA

Two speakers at the University of Minnesota Mining Symposium held in Duluth Jan. 11 emphasized the necessity of providing more trained iron ore and taconite processing plant supervisors in the Lake Superior area.

William R. VanSlyke, Taconite, range metallurgist for the Cleveland-Cliffs Iron Co., said: "As plants increase in complexity, it becomes a vital necessity to have top-notch plant supervisors if the potential gains in flow scheme and equipment improvements are to be actually realized and if plant operations are to be on an efficient basis."

M. P. Walle, Hibbing, chief research engineer for the Minnesota State Mines & Minerals Division, proposed to attack the problem by organizing courses in high schools and junior colleges to prepare students for supervisory positions in iron ore mining and taconite processing industries. He advocated a direct application of mathematics, chemistry and physics courses to jobs in the mining field.

Other speakers were Milton Williams, Duluth, associate chemical engineer, Oliver Iron Mining Division; Fred DeVaney, Hibbing, chief metallurgist, Pickands, Mather & Co., and Louis J. Erck, Ishpeming, Michigan, chief metallurgist for Cleveland-Cliffs.

Jessie mine, Jessie Mining Co., south of Pickands, Mather & Co.'s West Hill mine, near Grand Rapids, shipped 108,000 tons in 1955. Mine was not operated in 1954, and shipped 167,255 tons in 1953.

New officers elected by the Minnesota Section of AIME at Duluth on Jan. 9 were: F. D. DeVaney, Hibbing, chairman to succeed Milton F. Williams, Duluth; Clarence H. Sleeman, Virginia, first vice-chairman; John D. Boentje, Hibbing, second vice-chairman; Wayne W. Beebe, Coleraine, third vice-chairman, and Norman Moberg, Duluth, secretary-treasurer.

Pacific Isle Mining Co. shipped a total of 653,707 tons in 1955. The Uno-Kerr-Lamberton area with 181,986 tons was its second largest producer as well as its oldest. Pacific Isle was organized after World War No. 2 and the North and South Unos, Kerr and Lamberton were its first leases. The Wacootah at Mountain Iron had first place with 196,239 tons. The Wacootah was opened up in 1906 by the Pitt Iron Mining Co. and has produced over 8-million tons since that date. It was operated by the Wheeling Steel Corp. (no longer a Mesabi range operator) for 20 years and was taken over by Pacific Isle in 1952.

Emmett mine shipped 111,263 tons, largely produced by Pacific Isle for Oliver Iron Mining Division in trespass operations and ending production at this property. Emmett screening plant has been moved to the Wacootah.

Development and remodeling work will be conducted at the St. Paul mine, which Pacific Isle recently leased from Republic Steel, during the winter. Pacific Isle's remaining tonnage for 1955 came from seven other properties. Its farthest east operation is the Graham No. 2 which adjoins the Wentworth mine of Jones & Laughlin in Mesaba Township and shipped 75,454 tons.

Oglebay, Norton & Co. produced 1,121,681 tons in 1955 from its Canton and St. James mines, both on the eastern Mesabi range.

Zontelli Brothers shipped a total of 574,385 tons from four ranges: the Cuyuna, Mesabi, Gogebic and Menominee. The Cuyuna range contributed the largest tonnage (367,802 tons) and the highest producer, the Mangan-Joan (181,790 tons). Zontelli Bros. and North Range Mining Co. were the two companies of the smaller group to operate on four ranges.

M. A. Hanna Co. has an extensive winter stripping program which includes the Enterprise, South Agnew, Morton, Douglas, Mississippi Group, Parcel Three, Perry-Carlz and Cooley district on the Mesabi range. Cuyuna range mines which are participating are the Maroco, Louise, Hillcrest Extension, South Hillcrest, Huntington, Feigh and Portsmouth. The properties in Fillmore County also will do some stripping. Total stripping involved will amount to about 13-million cubic yards.

In addition to the stripping a heavy-media plant will be installed at the Douglas mine; the South Agnew skip pocket will be lowered another lift; the Morton stripping conveyor stacker will be moved; Parcel Three mine will construct a heavy-media plant, dry and service garage and a service garage will be erected in the Kevin pit to serve the mines in that area. At the Spring Valley mines in Fillmore County a scrubber will be installed in the plant.

M. A. Hanna Co.'s 1955 shipments of 14,195,676 tons were 1,479,398 tons less than those of high 1953. They place Hanna in second position, next to Oliver Iron Mining Division and 1,119,909 tons more than third place Pickands, Mather & Co. Hanna production came from two Minnesota ranges, the Mesabi and the

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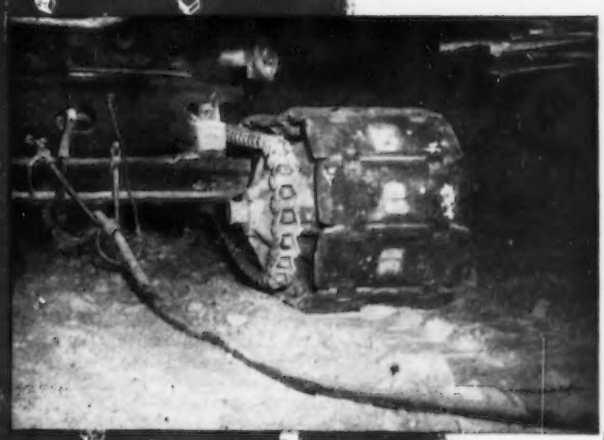

The Jefferson Island Salt Mine—where salt analyzes better than 99% pure NaCl—is located 1,000 feet below sea level at Jefferson Island, Louisiana. Operating conditions in the salt beds are so difficult that ordinary cables were chewed up by the abrasive action of the salt. Before standardizing on Hazacord Portable Cables, 25 to 40 man hours per week were spent on repairs to the portable cables used on undercutters, jumbo drills and electric shovels. Now—with Hazacord—this costly repair work is eliminated.

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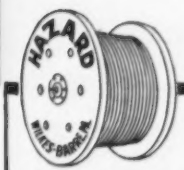

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Minnesota *(Continued)*

Cuyuna and Fillmore County (totaling 12,082,093 tons) and two Michigan ranges, Marquette and Menominee: 1,906,194 tons.

Largest producer of the four ranges was the Enterprise mine near Virginia, Minn., which made its first shipment in 1952 of 270,483 tons. In 1955 the mine shipped 1,545,634 tons. The South Agnew and Agnew No. 2, former underground mine operated by Jones & Laughlin, produced 1,069,214 tons. The Morton, another former underground mine which made its first open pit shipment in 1954, shipped 624,678 tons, putting it in fourth place of the company's Mesabi range mines. Leading shipper of the 13 Cuyuna range mines was the Portsmouth with 686,238 tons. Fillmore County properties had 240,418 tons. 207,389 tons of Hanna's total came from Iron Mountain, Mo.

Snyder Mining Co. during the 1955 season, shipped 821,463 tons from its four Mesabi range operations: the Webb-Sellers; Whiteside; Shenango and South Tener. In 1954 the properties produced 631,201 tons. Shenango mine has been a steady producer for over 50 years. From its opening in 1904 by the Shenango Furnace Co. to date it has shipped about 17½-million tons.

E. W. Coons Co.'s 1955 shipments amounted to 550,821 tons from eight Mesabi range properties, including 182,528 tons from the Commodore mine near Virginia—the largest producer. The Commodore was opened up in 1893 by the Corrigan, McKinney Co., making it one of the Mesabi range's oldest active mines. It was operated by Republic Steel Corp. in 1936-'37. A new approach will be made to the Commodore pit during the winter.

Pickands, Mather & Co., with a total of 13,075,767 tons shipped in 1955, was in third place among the Lake Superior area iron ore producers, following Oliver Iron Mining Division and the M. A. Hanna Co.—behind the latter company by a little less than 1,120,000 tons. Pickands, Mather & Co. was again the only operator to produce from all six Minnesota and Michigan ranges. On the Vermilion range it had one active property, the Zenith, which was opened up in 1892 by the Zenith Mining Co. and was operated in 1896-'97 by Franklin Rockefeller. The Zenith, during its 65 years, has produced more than 19½-million tons of high grade ore and still has about 2-million tons of estimated tonnage remaining. On the Marquette range P.M. & Co. is represented by one mine—the Volunteer at Ishpeming.

The Mesabi range had 12 shippers headed by the Mahoning with 2,023,299 tons. This mine was also P.M.'s largest producer on all ranges. Opened up in 1895, with its first stripping done by horse drawn scrapers, it has produced over 103-million tons of ore and still has years of active life remaining. The Mesabi furnished over 58% of P.M. & Co.'s total tonnage.

Charleson Iron Mining Co. shipments for 1955 were 169,310 tons, nearly 41,000 tons above those for 1954. Charleson's best year since 1950 was in 1951 when 200,363 tons were produced. All shipments came from the company's concentration plant at Virginia which treats the lean ore stockpiles at the Missabe Mountain and Minnewas mines.

Cleveland-Cliffs Iron Co. has awarded a contract to Western-Knapp Engineering Co. for the design and construction of a two unit cyclone plant addition to its Holman-Cliffs mine plant at Taconite. The unit is to be ready to operate in early 1956.

MICHIGAN

Globe-Cornell mine of the Globe Iron Co. on the Menominee range at Iron Mountain shipped 51,290 tons in 1955, its best year since 1950 when it produced 52,235 tons.

Montreal mine of Oglebay, Norton & Co. at Montreal, Wis., on the Gogebic range, produced 1,090,951 tons in 1955. The Montreal has shipped over 1-million tons in six of the past nine years. Its smallest shipment during that period was in 1954 with 938,284 tons.

NEVADA

Minerals Engineering Co. has taken option for operating rights on an unusual gold-uranium property 30 miles north of Pioche District, Blair T. Burwell, president of the concern, reports.

The option is from the Atlanta Gold and Uranium Co. of Reno, in which Roy Hardy, Getchell Mining Co. officer, is a figure, Mr. Burwell said.

Under the agreement the Colorado firm will investigate the possibilities of transforming the underground property into an open pit producer of gold and uranium.

Johns-Manville Corp., a major producer of asbestos building materials, is considering entering the gypsum business.

Leslie M. Cassidy, chairman, announced that J-M has signed an option on a large gypsum deposit in southern Nevada. He also added the firm's exploration department is "examining additional gypsum deposits in other parts of the country."

The optioned deposit is between Las Vegas and Henderson, and is called the "Lucky Gypsum" property.

Johns-Manville will soon begin diamond drilling, trenching and other exploratory work on the property to determine the quality and extent of the gypsum deposit. It's expected preliminary work will be done within a year.

Core drilling operations began late in January on the Lambertucci uranium property north of Tonopah. Property is under lease to Jack Turner and associates, the work on an extensive development and exploration program is getting

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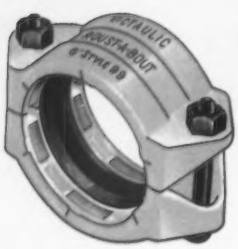

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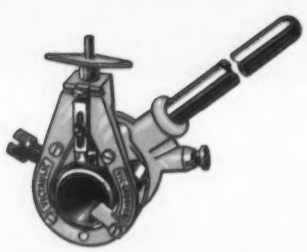

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Nevada *(Continued)*

underway. Joe Dowd, of Moab, Utah, is engineer on the project, and is being assisted by Willis Munger and Walter Viscount, both of Tonopah. Associated with Turner on the project are Mitchell L. Williams and Kedric M. Bailey, both of Moab.

Magnet Cove Barium Corp.'s new barium mill went into full operation at Battle Mountain during January. The mill, with a capacity of 175 to 200 tpd, is situated north of the Southern Pacific railroad adjoining the Battle Mountain townsite. The ore is ground to powder fineness and sacked in 100-lb bags for shipment. During January the mill operated only one shift daily, but as the mine output increases it is expected that a 24-hour mill operation will be started. Company's Greystone mine has been closed since early December when the Mill Creek road was closed by heavy snow. It is one of Nevada's largest barite deposits, and enough ore was stockpiled to supply the plant until mining work can resume. W. E. Edgar is resident manager of the company, which has its head offices in Houston, Texas. The mill and mine will employ 50 men when full operation can be resumed.

Nevada's mineral production during 1955 reached an all-time high, according to the Nevada Mining Assn. Value of the year's output is estimated by the U. S. Bureau of Mines at $105-million. Of this amount metals accounted for about $90-million and non-metallics $15-million. Increase is due to greater production of copper, in which Anaconda Co.'s Weed Heights operation figured large, and to the number of large tungsten producers in the state.

Bruhi Mining Co. which during 1955 operated its Argentite mine and its big silver mill at Silver Peak in Esmeralda County, closed down the operations there during January. The recently completed mill was operating at its capacity of 200 tpd during most of the year, and 40 men were employed. The mill and mine together kept the town of Silver Peak prosperous, but now the town as well as the mill and mine is shutting down.

First shipment of tungsten ore was made during January from the Diablo mine in Elko County operated by Paul D. Montgomery, of Wells, who resigned his position on the Wells police force in order to develop his claim. Three men are working a tunnel low on Mt. Diablo, and have uncovered a 12-ft vein of scheelite which assays 6%. The first shipment consisted of 20 tons sent to the Getchell Mill in Humboldt County, and it is reported to have returned $126 per ton.

Anaconda Co.'s big copper operation at Weed Heights continues at full capacity, mining, crushing, leaching and precipitating 11,000 tpd of low grade oxide ores. In full swing since 1953, the operation has produced a large gaping hole in the eastern flank of the Singatse Range which is rapidly approaching the size of the

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Nevada *(Continued)*

pits in the Ely mining district. Electric shovels handling 7 cubic yards lift the ore into 20-ton trucks which haul it to the crushers less than a mile distant from the pit. Conveyor belts are used to transport the crushed material to the leaching vats where large supplies of sulphur from the Leviathan was stockpiled at Weed Heights during the summer, to last through the winter operations when the sulphur mine must close due to its high altitude and inaccessibility.

Nevada's six iron mines produced 250,764 gross tons during the first 10 months of 1955, and most of the low-grade ore was shipped to Japan. The state's big iron property is the Modarelli mine near Pallisade which is operated by J. R. Simplot Co., and which ships 2,000 tpd ore. Other producers include the A & B Mining Co. which operates the Iron King mining property in Humboldt County, the Dodge Construction Co., which operates the Segerstrom-Heizer property in Pershing County, the Standard Slag Co. which operates the Minnesota Mine near Wabuska, and the Phelps-Stokes mine at Gabbs.

NEW MEXICO

United Western Minerals, Inc., disclosed in Denver early in February the company has received four separate proposals for construction of a uranium processing mill at its orebody in the Ambrosia Lake area 26 miles north of Grants.

Alva Simpson of Santa Fe, president, said proposals have been received from Climax Molybdenum Co., Golden Cycle Milling Corp., Kerr-McGee Oil Industries, Inc., and the Rio Del Oro Uranium Co.

Simpson said the firm has a $130,000 exploration program under way to determine the exact size of the orebody, but that "until we know for sure, we are not going to make any public announcement."

Portales lead mine, near Bingham, has been purchased by the Oscura Co., Inc. of Dallas, Tex. and a 200-tpd mill is under construction at the mine site, according to H. M. Prince, manager of the firm. Lead, barytes and fluorspar will be recovered from the open pit operation.

Purchase of 100 acres west of San Antonio was made by George McKenzie, of Socorro, who will mine high grade manganese at the site. A 200 tpd output is foreseen by McKenzie when access roads are completed.

NORTH DAKOTA

Manidon Mining Co. of Mandan, and Northgate Uranium Co. have begun stripping several hundred tons of uranium-bearing lignite from two southwestern North Dakota beds. Each company will truck 100 tons of the ore to the Atomic Energy Commission at Edgemont, S. D. where it will be weighed and sent to various AEC laboratories. Northgate Uranium Co. plans to mine about 500 tons in addition to the 100 tons it will ship to AEC. This uranium ore is the first, in more than small samples, to be mined in North Dakota.

Some companies have investigated lignites; AEC considers them "very interesting."

NORTH CAROLINA

Estimates for 1955 state output place the total value at $43,480,000, or 11% over 1954, according to the USBM. Tungsten output was up 3% over 1954 and gold, lead, silver and copper remained about the same. Feldspar is expected to show a 13% increase over the previous year and mica, 36%.

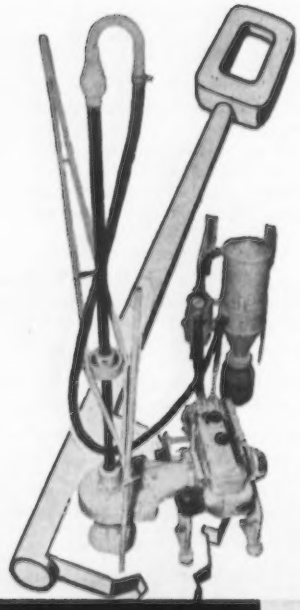
Beryllium, asbestos and vermiculite were down.

TRI-STATE DISTRICT

Lead and zinc production in the Tri-State district in 1955 by areas was as follows: (short tons)

	Crude Ore	Pb conc.	Zn conc.
Okla.	2,307,800	20,680	76,580
Kans.	1,449,500	6,200	42,720
Mo.	4,145	———	33

(Continued on p 155)



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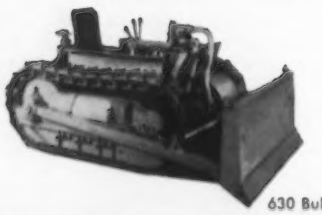

630 Bulldozer

NEW SHAFT SINKING TECHNIQUES

Shaft sinking contractors have developed a new technique for loading out the broken rock in the bottom of the shaft by using the Eimco 630 crawler.

The method consists of lowering the Eimco immediately after the blast and proceeding to muck out the round into 3-yard tubs. Time per loading is approximately 2½ minutes but will probably improve as the crew gets more familiar with the new equipment.

The difference in the techniques is in the method of shooting the bottom which leaves the bottom in the shape of a "V" which provides a "face in the shaft for the loader operating on an incline.

The introduction of the Eimco 630 in shaft mucking eliminates the necessity of using expensive single purpose equipment, special framing in the shaft, temporary guides and other special setups. When the shaft is completed the Eimco is ready to work in the drifts on production loading.

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New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-101

TAXE$ . . . earned by brick

If you own securities . . . if you're paid a salary . . . if you earn commissions . . . no matter how you make your income, the starting point is brick. Refractory brick.

Refractories, the industry behind industry. Refractories that contain and control flame . . . the flame that produces metals, glass, paper, rubber, oil, cement, power, transportation. Everything that's made or moved requires them.

But those requirements vary . . . vary over a vast range of applications. To provide them in almost infinite variety and enormous quantity, Grefco employs extensive research, maintains the world's most modern refractories laboratory, and supplies a Complete Refractories Service from strategically located plants, both here and abroad, that draw on the world for materials.

A Complete Refractories Service
GENERAL REFRACTORIES COMPANY
Philadelphia 2

SEND FOR THE MOTION PICTURE: THE GREFCO STORY

It is a beautiful 16 mm. motion picture in full color and sound which relates the fascinating and little understood story about the refractories industry... *the industry behind industry.* Viewing time is 26 minutes. If you would like to show it to executive, employee, social, church or other groups, a request on your letterhead is all that is necessary. Address General Refractories, Philadelphia 2.

GENERAL REFRACTORIES

Full traction while turning. The Turbo-Dozer has four-wheel drive with rear-wheel steer: full traction is maintained on all four wheels even while dozing on turns during fast in-and-out passes—no lost loads or tire scuffing. With power-shift transmission, the Turbo-Dozer can be shifted instantly, gets in and out fast. If the front wheels have a tendency to rise, the operator can tilt the bowl back and build up the load weight on the bowl and on the front wheels. No need to raise the bowl or disturb the grade.

Exclusive power-tilting bowl. The operator can tilt the bowl back and forth while travelling: a 33 degree arc between "float" and "dig" positions. This photo shows the end of a pass with the bowl in "dig" position. Now the operator can tilt the bowl forward to dump the load. Note the hubs of the Clark axles: final planetary reduction at the wheel takes 70% of the torque load off the axle shafts.

Swinging drawbar. The Turbo-Dozer's swinging drawbar is mounted to the frame below the centerline of the wheels. This assures maximum traction and stability for heavy towing assignments. It's a fast and versatile dozer for relocating electric cables, towing work-houses, pulling other mining equipment up steep grades, general maintenance.

Report on the MICHIGAN TURBO-DOZER:

New dozer features 27 mph speed, power-tilting bowl, rear-wheel steer

The new 2¾ yd. capacity Michigan Turbo Dozer combines rubber-tired speed and mobility with outstanding traction and power. Its turbocharged diesel engine develops 165 hp, with maximum rimpull of 28,000 lbs. At 27 mph, it runs rings around any dozer on the market! The Turbo-Dozer can cover assignments from one end of the mine to the other. It runs on rubber from one job to another—shovel clean-up, dump, road maintenance jobs, cable relocation, miscellaneous towing.

Exclusive power-tilting bowl. A powerful double-acting hydraulic cylinder tilts the bowl back and forth through a 33 degree arc. With your right hand on the bowl-control lever, you can change the bowl angle from "dig" to "float" as you travel—precision control in maintaining the grade. You can hook the cutting edge under tough rock or obstructions—work it up and down to root them out. Two 6-inch lift cylinders give you tremendous lifting power and down pressure, from 24¼ inches below ground level to 43¾ inches above.

High flotation tires, oscillating axle. Big 18.00-25 low pressure tires (nearly 7-foot tread) give the Turbo-Dozer excellent ground contact in dry, wet or sandy footing. You can cross railroad tracks or travel along the ties or road bed. On uneven terrain, the steering-drive axle oscillates to keep both rear wheels in firm contact with the ground. With 14½ inches of ground clearance underneath, it's practically impossible to get "hung up".

Full traction while turning. The Turbo-Dozer gives you full tractive effort even in a turn. *All four wheels are always driving,* except when you declutch the rear axle for highway travel. Rear-wheel steering eliminates unnecessary tire wear—you don't brake or drag your inside wheels on a turn.

In maintenance of mine roads, you can doze a load down a steep grade, turn it into a tight spot—and still have full power to pull yourself out with the wheels cramped the way you went in. If one wheel begins to slip, a locking differential automatically applies power to the wheel with the firmest footing.

Power-shifting, 300% torque multiplication. Clark's exclusive power-shift transmission eliminates the conventional engine clutch and foot pedal—the most notorious cause of excessive maintenance and operator fatigue. With two fingertip levers on the steering column, the operator can instantly shift between High-Low and Forward-Reverse—even when moving in either direction.

The 3-to-1 Clark torque converter gives you a steady power flow, regardless of speed. As the load gets heavier, the torque output automatically increases up to 300% at stall speed—gives you the extra torque to plow through the toughest spots. You can't stall the engine, and there's no clutch to slip.

Top speed 27 mph. The new Turbo-Dozer is 50% faster than any other rubber-tired dozer, four times faster than the average crawler. It dozes faster and travels faster, which means it will give you faster cycles going and coming. You can economically send the Turbo-Dozer on its own power to handle jobs many miles away, and you can cover more ground on any given job. But speed isn't the whole story. Once the Turbo-Dozer arrives at the site and starts to work, *it's got the muscle to do the job!*

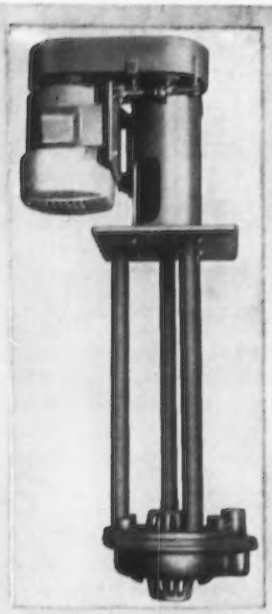
See the Turbo-Dozer movie. You can see the new Turbo-Dozer working typical jobs in a 20-minute color movie—see how it will give you faster cycles, more yardage or tonnage in every shift. Ask your local Michigan distributor to arrange a showing at your convenience—no obligation, of course. Or write direct: we'll send you a 20-page photo booklet which gives complete details on the new Michigan Turbo-Dozer.

MICHIGAN is a reg. trade-mark of Clark Equipment Co.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2465 Pipestone Road
Benton Harbor 35, Michigan

← **Completely power-controlled.** Operators say that the new Turbo-Dozer is the "easiest" machine they ever operated. The power-shift transmission eliminates the conventional clutch, does all the work of shifting. Here the operator dozes a load against the bank; now he'll power-shift to reverse and pull away fast. Four-wheel power brakes and power steering are also standard equipment.



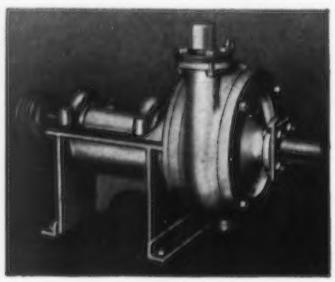
Model 300 Sump Pump

Galigher Acid-Proof SUMP PUMP

SLURRIES • CORROSIVES • FROTHS

This rugged, welded steel, rubber covered sump and froth pump is built to handle industry's toughest pumping jobs. Its application covers hundreds of materials in a score of industries including pumping acids, salts and chemicals and material containing up to 60 per cent solids —does not air lock or choke. The following are typical daily jobs in mining, metallurgical and chemical industries: floor clean-up . . . flotation tailings, concentrates and middling froth return . . . acid leakage from process tanks . . . solution transfer . . . uranium leach slurries and solutions . . . mine drainage . . . pickling solutions . . . waste dispo al . . . HCl, $CaCl_2$, HNO_3, H_2SO_4, H_2SO_3 . . . ceramics handling . . . saturated brines.

Model 200 Sump Pump



We also manufacture the well known VACSEAL pump for material handling and corrosive solutions. Sizes 1½" to 8".

- **CAPACITY**
  Pumps illustrated (models 200 and 300) deliver up to 100 GPM, handling heads up to 50 feet.
- **VERSATILE DESIGN**
  Light, portable—Intermittent or continuous operation—Direct or V-belt drive—Constant or variable speed.
- **SIMPLE CONSTRUCTION**
  No submerged bearings—No packing gland—No mechanical seal—Rubber-covered parts—Solid rubber impeller—Double suction thrustless impeller.

MAIL COUPON
for detailed information on your pumping problem.

THE GALIGHER CO.
P. O. Box 209, Salt Lake City 10, Ut.
Gentlemen:
Please send me information on a pump that will handle the following:

1. Liquid.....
2. % solids.....
3. °F.....
4. pH....Type of acid.....
5. GPM.....
6. Head (ft.).....

Name.....
Company.....
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UTAH

American Gilsonite Co. is below 400 ft in sinking its main shaft on the Cowboy gilsonite vein, according to word from Bonanza.

The shaft will tap the vein, largest on earth, in connection with development of hydraulic jet mining serving the firm's $13-million gasoline-coke refining plant to be built at Fruita, Colo. 80 miles east.

E. F. Goodner, president of AGC at Salt Lake City, said the shaft would go to 1,000 ft. Conventional gilsonite mining methods are being used to deepen. Firm's own men are driving the shaft.

AGC, a joint affiliate of Standard Oil Co. (California), also is straightening its Bonanza vein shaft in connection with the new mining program.

New Park Mining Co. has signed agreement with U. S. Smelting, Refining & Mining Co. covering exploration and development on 103 acres of patented lands in the Park City district.

New Park has option to buy the properties.

Under terms of the agreement, the firm also may pay for the claims out of royalties from any ore mined. Royalties are fixed on a graduated scale, depending on ore value.

The eventual purchase price is placed at about $100,000.

In connection with the property agreement, New Park signed a new milling contract with USSR&M. The firm previously had been shipping its lead-silver-gold-copper-zinc ores to Bauer, Utah, mill of Combined Metals Reduction Co., which in turn had smelter contract with International Smelting & Refining Co. (Anaconda Co.)

Merger of Elk Ridge Uranium Corp., with producing uranium mine in San Juan County, has been effected with Federal Uranium Corp.

Federal's president, W. D. Nebeker, said the Elk Ridge mine has been producing 50 tpd.

Its output will hike Federal's ore production to 4,700 tons monthly—most of which now comes from the Radon mine, Big Indian district, operated by Hecla Mining Co.

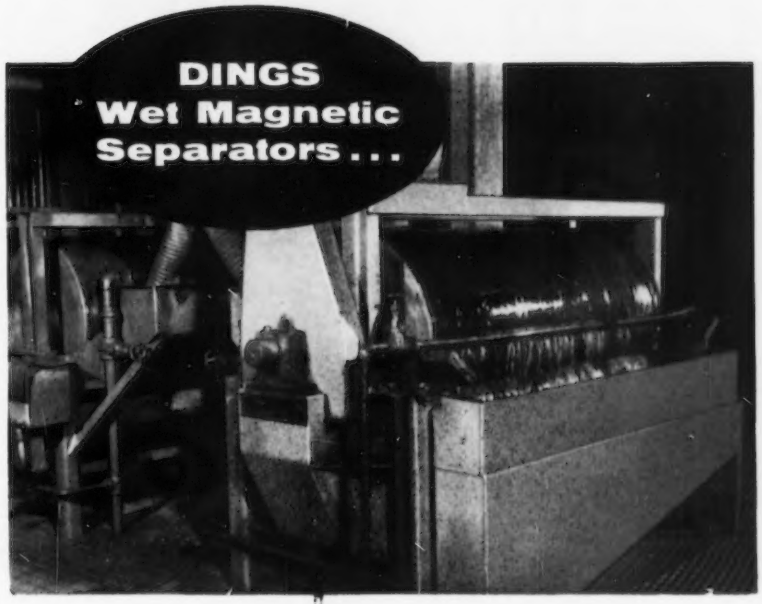
Other production accrues from Federal's Santa Fe claims in New Mexico and from the Yellow Circle mine in Utah.

Gulf Minerals Corp. is in negotiation with New Park Mining Co, Salt Lake City, for a joint venture agreement covering exploration on 15 sections of ground on west part of Park City area.

Standard Uranium Corp. is producing from two claims on its Big Buck properties, Big Indian district San Juan County, at rate of 450 tons of uranium ore monthly.

W. R. McCormick, president, advised shareholders that Standard's output in January was only 27 tons and in February, 1,168 tons. Annual output last year was 96,440 tons.

The firm's profit and loss statement discloses the effect of the Atomic Energy



for Maximum Efficiency and Economy in all classes of separation and Concentration

• In heavy-media separation, Dings Wet Drum Magnetic Separators assure maximum recovery of magnetite and ferrosilicon . . . up to 99.8%.

In direct concentration service, selective separation possible with Dings design assures rejection of high tonnages of low iron non-magnetics in rod or ball mill cobber positions and consistently high grade silica-free concentrates from finisher separators.

Whatever your separation or concentration problem, over 50 years of specialized experience, backed by actual field trial where required, is available to assist you in selecting the best type of separator to solve your specific needs.

DINGS MAGNETIC SEPARATOR CO.
4716 W. Electric Ave., Milwaukee 46, Wis.

For further details, send for Bulletin B-1500.

Dings

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WC155-2/3

Is This the PIPE You're Looking For?

When you need lines for mining and quarrying operations, consider the basic advantages of Naylor Spiralweld pipe in both high and low pressure air and water service.

From a structural standpoint, the Naylor spiral truss provides extra strength and safety for mining operations. The same structure adds collapse strength when Naylor pipe is used in vacuum service on ventilating lines. Here, too, the lockseamed, spiralwelded structure permits use of lighter gauge material for lower cost without sacrificing performance.

For installation ease and economy, the one-piece Naylor Wedge-Lock Coupling will connect lines better than by any other method.

Sizes range from 4" to 30" in diameter with lengths to 40 feet.

Write for Bulletins No. 507 and No. 513.

NAYLOR PIPE

NAYLOR PIPE COMPANY
1243 East 92nd Street
Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Utah *(Continued)*

Commission's lime penalty on uranium producers in the district.

Included in the cost or expense figures for Standard's 1955 operations is an item of $450,000 for lime penalties.

McCormick looks toward considerable improvement, if not virtual elimination, in these deductions once the mill of Uranium Reduction Co. at Moab is finished later in 1956.

Grand County prospectors apparently feel Atomic Energy Commission has over-looked orebodies on more than 12,000 acres of land withdrawn for probe by AEC geologists.

More than 600 claims were filed by 10:30 a.m., the morning of Jan. 18 when restoration was made by AEC on the lands previously withdrawn.

Another Moab area uranium property went into production in January when Radiore Exploration Co. took over operation of the Chief mine under an operating agreement with the owners, National Uranium Corp. of Utah.

James R. Downing, president of Radiore, said about $100,000 had been spent on the property in road building and other development work by previous operators before Radiore took over. Radiore miners broke into ore on their tenth working day, and Downing said he hoped to ship about 50 tons weekly.

Five States Uranium Corp., developing a property known as the Dirty Devil No. 3 on the San Rafael Swell, was stockpiling and shipping at the rate of 30 tpd in February. Webster H. Russell, Five States secretary-treasurer, said profit to the corporation now should approximate $4,000 monthly.

WASHINGTON

Mineral and metal production of the four Pacific Northwest states in 1955 amounted to more than $500-million, according to a preliminary annual report released by the U. S. Bureau of Mines' regional office at Albany, Oregon. The total was listed at $516,045,000 compared with $454,825,058 in 1954. Including aluminum, the state of Washington led in value of mineral commodities produced, with $253,444,000 against $227,871,058 in 1954.

Aluminum production of the five Washington reduction plants was 451,000 tons valued at $195,300,000 in 1955, compared with 432,534 tons valued at $175,338,058 the previous year. Zinc production was valued at $7,279,386 in 1955, compared with $4,817,664 in 1954; lead at $3,103,670, compared with $2,723,012; copper at $2,925,220, compared with $2,145,240; gold, $2,669,800, compared with $2,335,900 and silver $382,248 compared with $283,946.

Leading producers of zinc in the State ranked in the following order: Van Stone open-pit mine in Stevens County operated by American Smelting & Refining Co., Pend Oreille, Grandview and Deep Creek; of lead, Pend Oreille mine,

Wire Rope at Work—Here's an installation that any mine owner could show with pride. It is the "A" shaft headframe at Peterson Mine, in Michigan's Gogebic Range. The Peterson property, which yields large tonnages of iron ore, is operated by Puritan Mining Company, Ironwood.

The largest, sturdiest shaft ropes ever used in the region give added distinction to this trim installation. The balanced skips and the balanced cages require four separate ropes, the pair for the skips being 2¼-in. diameter, those for the cages 1¾-in. All of these husky wire ropes are of Bethlehem manufacture—Purple Strand grade, of course. Purple Strand is Bethlehem's best, and here, as in mines and quarries all over the country, this tough wire rope is more than equal to the jobs assigned it.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:
MINING • QUARRYING • CONSTRUCTION • PETROLEUM • EXCAVATING • LOGGING • MANUFACTURING

Bulk Mineral Storage by the SAUERMAN Method

Potash Recovery at Carlsbad

How Sauerman Scraper Storage Reduces Costs

Remote Control

This prominent producer of basic minerals uses Sauerman 1½-cu. yd. DragScraper Machines to reclaim potash at 200 thp. Total area covered is approximately 125 by 370 ft. Building capacity is 60,000 tons.

Here's how a Sauerman Machine cuts costs:

One operator, located in a safe station overseeing the entire area, can recover practically 100% of all stockpiled material.

All highly machined parts, hoists and motors can be located outside of the building and protected from corrosion and dust.

When parts are replaced—sheaves, clutch or brake linings—the machine is restored to practically new condition, even though it may be twenty or more years old.

Only the Crescent scraper and cables contact the material. The scraper machine can be designed to operate the scraper on top of non-caving material. This allows the scraper to break down any high faces that may be standing.

Sauerman Storage Machines are built for hourly capacities of from 20 to 600 cu. yds. A partial list of producers and manufacturers using some type of Sauerman equipment includes:

Crawford Chemical Co.
Davison Chemical Co.
Division of W. R. Grace & Co.
Duval Sulphur & Potash Co.
F. S. Royster Guano Co.
International Minerals & Chemical Corp.
Lion Oil Co.
Potash Company of America
Red Star Fertilizer Co.
Southern Agricultural Fertilizer Co.
Tennessee Farmers Cooperative
Virginia-Carolina Chemical Corp.

For ways to reduce your material handling costs, request Catalog E, *Bulk Storage by Scraper*, plus Field Report 227 and other reports on the handling of your material by Sauerman Machines.

SAUERMAN BROS. INC.

626 S. 28th AVE. · BELLWOOD, ILL.

Washington *(Continued)*

Grandview operated by American Zinc, Lead & Smelting Co., the Van Stone and the Deep Creek; of copper, Howe Sound Co.'s Holden mine, the Turk and the Eagle Mountain in Stevens County, the Kromona mine in Snohomish County and the Rainey mine in King County. The three supplying most of the gold were the Knob Hill, near Republic, the Gold King near Wenatchee and the Holden near Chelan.

Northwest Magnesite Co. at Chewelah was again the leading producer in the nation of natural magnesite. Production increased about 65% over that of 1954. Silica production increased 33% by Pacific Silica Co. from its deposit north of Spokane and Mineral Products Co. at Chewelah. Barite was produced by Manufacturers Minerals Co. at its open-pit mine near Addy in Stevens County. The only producer of gypsum in the State was Agro Minerals, Inc., working a deposit near Tonasket in Okanogan.

Northwest Uranium Mines of Wallace, Idaho says it has signed agreement for Phillips Petroleum Co. to explore and develop a large part of 100,000 acres leased by Northwest in Northern Idaho and Northeastern Washington. Most land is state owned, about 3,000 acres in Mount Spokane area. Phillips will return half net profits to Northwest company.

Dahl Uranium, Inc., has been granted prospecting permits on 4,500 acres of Spokane Indian Reservation land, and will be permitted to exercise four 160-acre leases on the best mineral areas it finds in its exploration program. Part of the land to be explored includes 600 acres south of the Midnite Uranium Mine, and 200 acres cover the northward extension of the uranium-bearing contact zone next to the Midnite permit areas.

William D. Weaver, a company consultant, said the mineral-bearing contact enters the Dahl permit areas less than 2,000 ft from the portal of the Midnite.

Sunset Mines, Inc., says it plans 300 ft of wagon drilling at a Ferry County uranium prospect in the spring, if funds are obtained. A number of outcroppings of commercial grade uranium ore have been found at the property, near Kettle Falls. Samples sent the AEC averaged 0.30 to 0.40% uranium oxide. The ore appears to be finely divided uraninite or pitchblende.

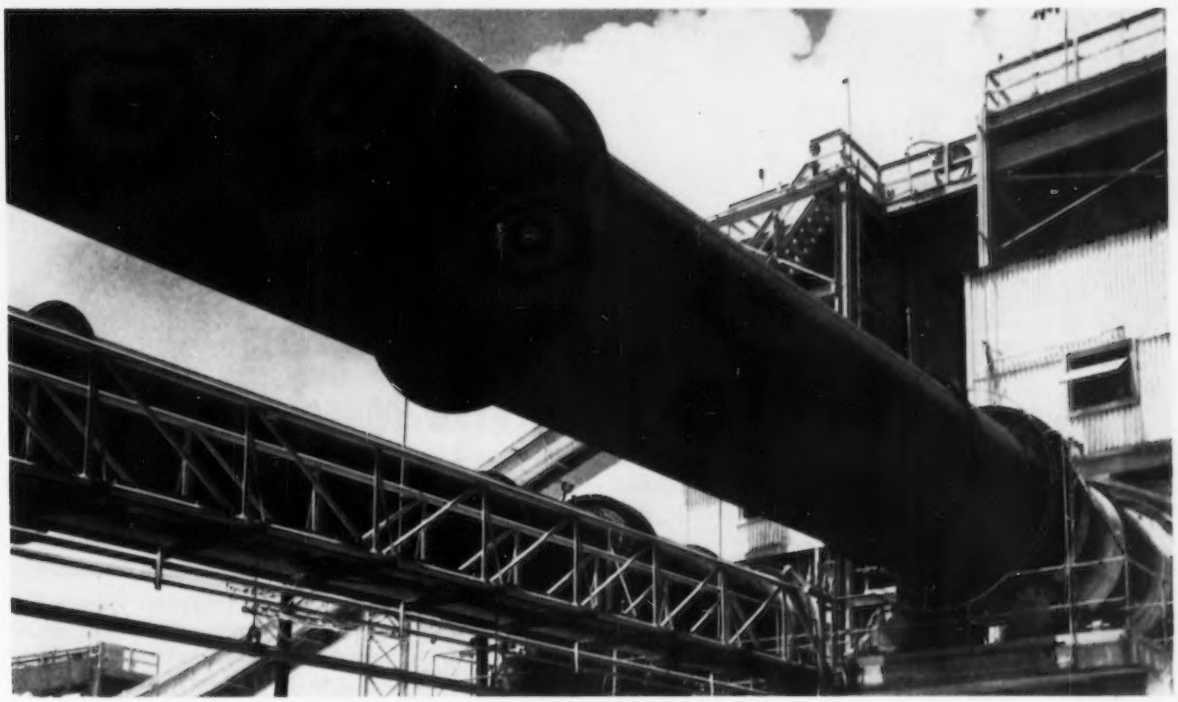
Reeves MacDonald Mines, Ltd., a subsidiary of Pend Oreille Mines & Metals Co., has added 126 workers since resuming operations four months ago after a two-year shut-down due to low zinc and lead prices. Sixty-four men are employed underground and 22 in the mill. Mill operations from Nov. 1 to Dec. 31 totaled 63,780 dry tons of ore, J. B. Shannon, superintendent, reported. Concentrates are trucked to Salmo, B. C. or Metaline Falls, Wash. and then shipped to smelters at Kellogg, Idaho and Great Falls, Mont.

R. S. McClintock Diamond Drill Co. of Spokane has resumed drilling operations at the old Lone Star copper mine on

Traylor ROTARY KILNS

PUT PEAK PROFITS IN

Processing Ore



Today profitable processing of ore depends more than ever on utilizing the most efficient methods and equipment.

For over a half-century Traylor has been the leader in the advancement of rotary kiln design. Traylor has engineered and developed many of the major modern improvements.

In the past 14 years alone, Traylor has built an average of over 1 rotary kiln a month. A total of more than 175 "Traylor-Made" Rotary Kilns are currently engaged in the processing of some 21 different products.

Traylor Rotary Kilns . . . custom-engineered and "Traylor-Made" to individual specifications . . . range in size from 7′ to 12′ in diameter and up to 450′ in length. Send for Traylor Kiln Bulletin #1115 containing complete descriptions, illustrations and specifications. A copy is yours on request.

TRAYLOR ENGINEERING & MFG. CO.

836 MILL STREET, ALLENTOWN, PA.

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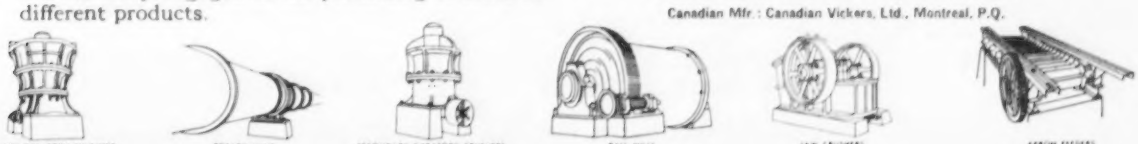


Diagram showing magnetic field for 2-coil, 36-in.-dia., 42-in.-wide pulley. Note how magnetic field blankets entire load.

New magnetic pulley stops tramp iron riding the load peaks

This new Stearns 2-coil electro-magnetic pulley effectively removes tramp iron riding the crest of a conveyor load as well as the pieces that pass close to the magnet's face. Two-coil design produces a powerful magnetic field that is deepest at the center of the conveyor belt where load is heaviest. Thus, the area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

Smaller, lower-cost pulleys now practical

Because of the nature of the magnetic field, smaller pulleys costing less can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of cases, the recommended new 2-coil pulley was of smaller diameter than a 3-coil pulley of comparable ability.

New, simple pulley selection method*

Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for Bulletin 303-C.

*Copyrighted 1954, Stearns Magnetic, Inc.

1133

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC., 624 S. 28th St., Milwaukee 46, Wisconsin

A Balanced Program for Improved Drilling

TEE CEE
(tungsten carbide insert bit)

LIDDICOAT
(used to destruction — no resharpening bit)

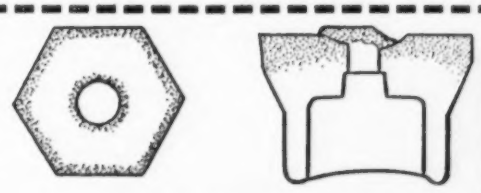
Carburized Drill Rod

To equal the fine drilling quality of Liddicoat bits, a drill rod has been developed to provide much greater footage and consequently lower cost per foot of hole drilled. The drill steel has been carburized to provide a stiff rod with a hardened section on the outside of the steel, and on the inside around the water hole. These hardened sections are supported by a strong ductile core.

Carburizing treatment has been designed to correct weaknesses existing in ordinary steel; namely, surface decarburization and low strength zones. By carburizing and hardening, tendency to fatigue failures, rapid wear in drill rods is lessened. The carburized rod incorporates mechanical and metallurgical refinements heretofore unavailable in drill steel.

⅞" Hexagon is the most popular section for feed-leg drilling. To secure the advantages of this cross section of drill steel, the Liddicoat bit is made in type 3 TEE CEE, 3-L and 3-H — all have the same socket size. Within the socket are forged six flats to match the flats on the rod. The bits are all interchangeable, which provides a type of bit best suited to ground conditions.

A trial order will prove the merit of this balanced combination to your entire satisfaction.



Dots in sketches indicate the hardened portions of cross section of drill rod and hardness pattern of Liddicoat bit.

WESTERN
Rock Bit Manufacturing Company
552 West 7th South • Salt Lake City 4, Utah

There's an economical Bemis FLEXIPIPE® that's just right for your ventilating job . . .

Bemis makes all grades of flexible ventilating tubing. One of them fits your job to a T . . . and at a money-saving cost . . .

Jute Grade FLEXIPIPE—Strong, durable, light, acid-resistant . . . this is the standard, versatile tubing of the industry. A regular workhorse. Weighs a fraction as much as metal pipe . . . much lower in cost, easier to handle, install and move. Good for long, rough usage.

Bemis Nyprene FLEXIPIPE—If you need a real "featherweight" flexible tubing that is also amazingly tough and durable and not affected by acids, specify Bemis Nyprene FLEXIPIPE.

Bemis Heavy-Duty FLEXIPIPE—What its name implies—made of a particularly tough, heavy-duty fabric that is treated to be highly resistant to gases, heat, fungus, acid and mine waters . . . everything.

You'll Also Profit by Using . . .

Bemis Rope Seam Suspension—The finest suspension . . . and costs you nothing additional. No sagging. Sliding clamps can be moved to the nearest support and hung on suspension nails. No horizontal wires, vertical collars, hooks or other gimmicks.

Your Ventilating Job is Our Job!

For mine or tunnel ventilation, Bemis FLEXIPIPE is rugged, long-lived, economical.

FLEXIPIPE is light . . . easy to handle and install.

Bemis NO-SAG Rope Seam Suspension costs you nothing additional.

Write, wire or phone for full information about Bemis FLEXIPIPE

Bemis

408-E Pine Street
St. Louis 2, Missouri

Washington *(Continued)*

Big Goosmus creek near the Canadian boundary according to reports from Curlew. The company which is under contract from Granby Consolidated Mining, Smelting & Power Co. of Copper Mountain, B. C., is putting down holes averaging about 200 ft at an elevation of 4,000 ft. Six men are employed under Merle Smith, foreman. The company drilled at the property for 6 months last year.

Aluminum Company of America's $2-million expansion program at its plant at Wenatchee has been accelerated because of present water conditions and a bright outlook for interruptible power and it is expected that the first series of new pots will be energized March 5, instead of the original May 1 date, F. N. Farquhar, works manager has reported. The company hopes to contract for a firm supply of power but is still dependent on the supply of interruptible. Alcoa's smelter at Wenatchee will have an installed capacity of 108,500 tons of primary aluminum annually.

Kaiser Aluminum & Chemical Corp. has contracted to purchase $20-million worth of natural gas from the Spokane Gas & Fuel Co., the largest fuel contract ever to be awarded in the Northwest. A 20-year contract has been signed with the fuel company to deliver 8,200,000 cubic ft of gas daily to the Trentwood and Mead plants effective as soon as supply lines are completed.

Dawn Uranium and Oil Co. began mining operations in the Kit Carson area of Mount Spokane in mid-January. Preliminary exploration was completed in December and a 300-sq ft area cleared. Virgil Chamberlain, Great Falls geologist, is directing the work.

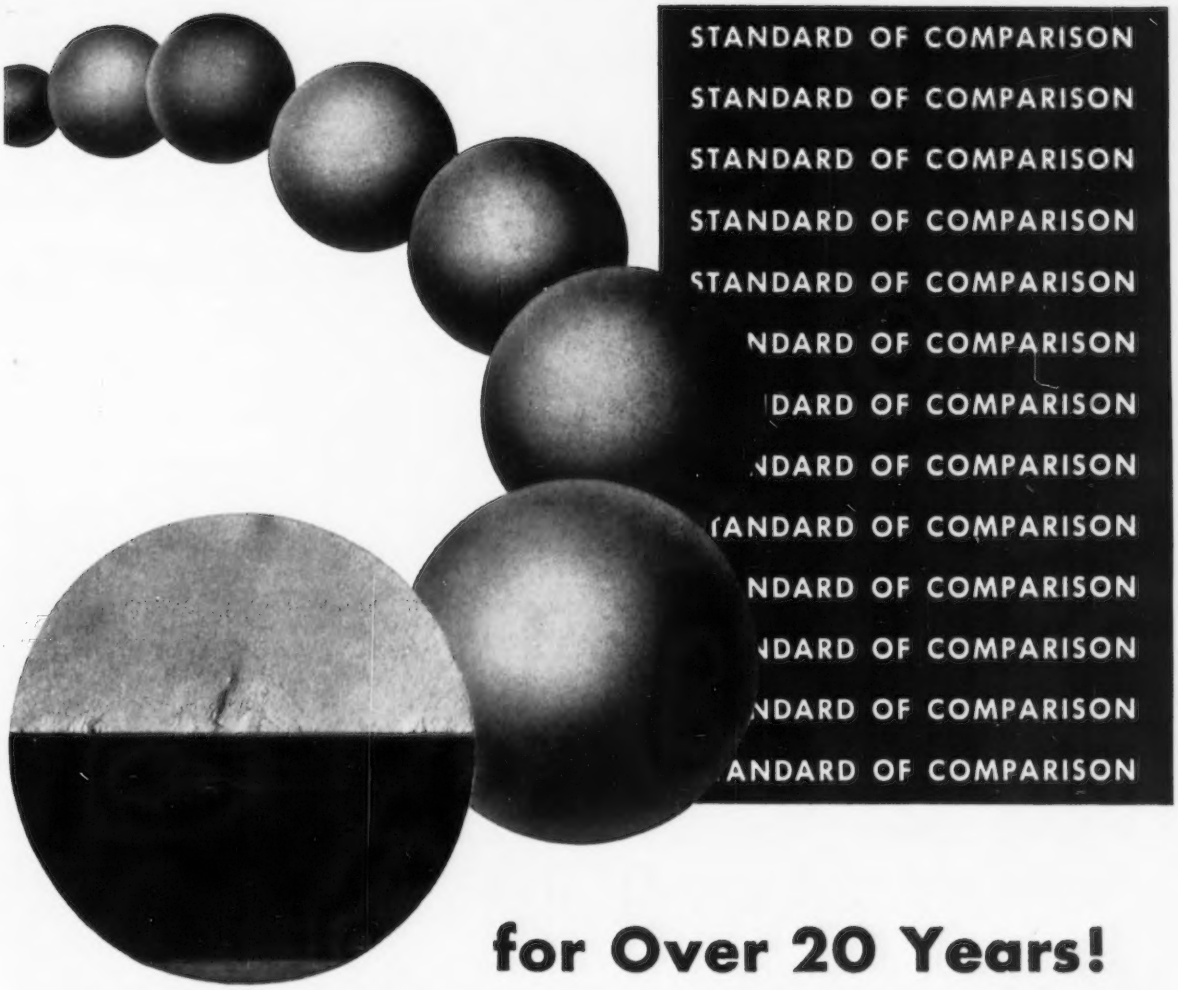
A mining program has been planned based on 20 holes drilled from 40 to 80 ft deep on the property. Drilling indicated commercial quantities of autunite. Dawn expected to ship first ore by the end of January and is seeking a contract with the AEC.

The firm also holds a 500-acre lease north of the Daybreak property in the Mount Spokane area. Dawn is the third Spokane area firm to announce production plans.

Chrome Cliff Mines, Inc., has been organized to develop chromite properties between Omak and Conconully in north-central Washington. Fred W. Wagener, Jr., of Prosser, president of the company, said the firm is capitalized at $200,000.

Thirty-six tons of ore have been shipped from a cliff-side deposit located in October by James Dow of Conconully, a partner in Chrome Cliff Mines, who was hunting the source of chromite float. The ore went to the Government purchase depot at Grants Pass, Ore.

Dahl Uranium Mine, Inc., has contracted for 2,000 ft of drilling on its property near Mount Spokane. Holes will be put down 25 to 200 ft to explore ore-bearing structures exposed by bulldozer. Nine mineralized zones have been uncovered. H. J. Tibbitts, president, said assays on



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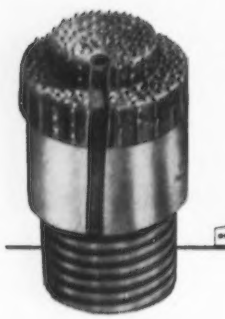

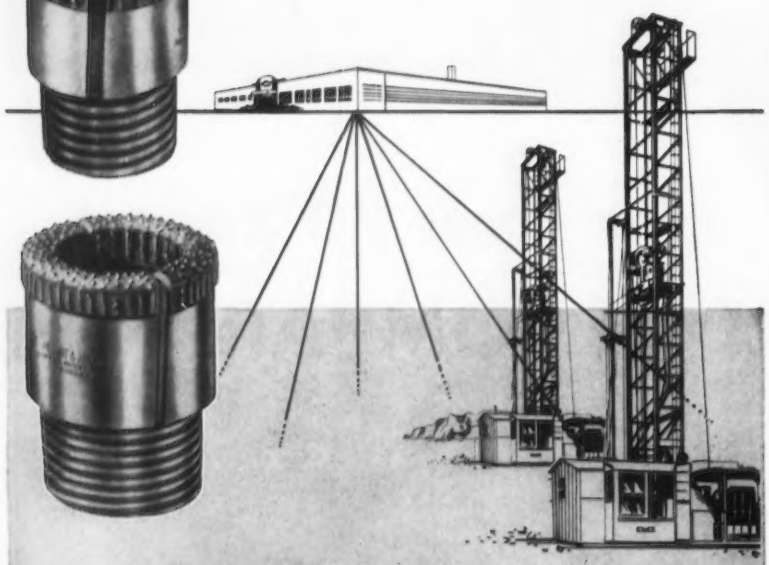

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Washington *(Continued)*

cores from preliminary drilling indicate commercial ore zones at depths from 23 to 25½ ft and from 76 to 77½ ft. The property was leased from Leonard A. Dahl, a son of Alfred Dahl, on whose property the Daybreak development is underway.

Daybreak Uranium, Inc., received a $35,000 initial production bonus in January from the Atomic Energy Commission. The bonus was paid on the first 10,000 lb of uranium oxide contained in the first 19 rail cars of ore shipped from the open-pit mine near Mount Spokane to Utah for processing. The company previously had been paid $44,306 for the 19 carloads.

By mid-January, Daybreak had shipped 73 cars of ore since early 1955 and planned 10 more carloads before closing its operations until spring. The last 12 cars shipped from the property have run from .30 to .34% uranium oxide.

Daybreak also has shipped 31 cars of 108 contracted for with Vitro Uranium Corp., Salt Lake City.

WYOMING

Further proceedings in a court order compelling the Pumpkin Buttes Mining District to accept claims without requiring financial consideration to surface landowners have been postponed.

District Judge G. A. Layman said he would allow no more motions in the case until the mining district has perfected a Wyoming Supreme Court appeal from Layman's peremptory writ of mandamus.

The writ had ordered the district recorder to accept claims without demanding a 5% overriding royalty and a 12½% cash participation in future sales as a condition of recording.

Michael Hoch of Gillette, the district's attorney, said the appeal will argue the writ was issued in error.

Layman said in an unofficial opinion the mining district has no legal right to record claims. "The state legislature has specifically enacted that a discoverer shall record claims with the county clerk," the judge said.

Layman explained an 1888 statute directed the discoverer to record claims with the district and then with the County Clerk, but an 1895 statute reversed this policy and required the discoverer to record with the county clerk.

The judge said in issuing the peremptory writ that the district's requirement of financial consideration for surface owners was "clearly" an attempt to establish rights over minerals which the government explicitly claims.

The District was formed Nov. 7 to make rules for entry of 46,440 acres of public land opened to prospecting Nov. 17. About 60 uranium occurrences had been reported in the general area.

Four mining firms working in Wyoming's latest uranium "hot spot"—the Pryor Mountain area on the Montana-Wyom-

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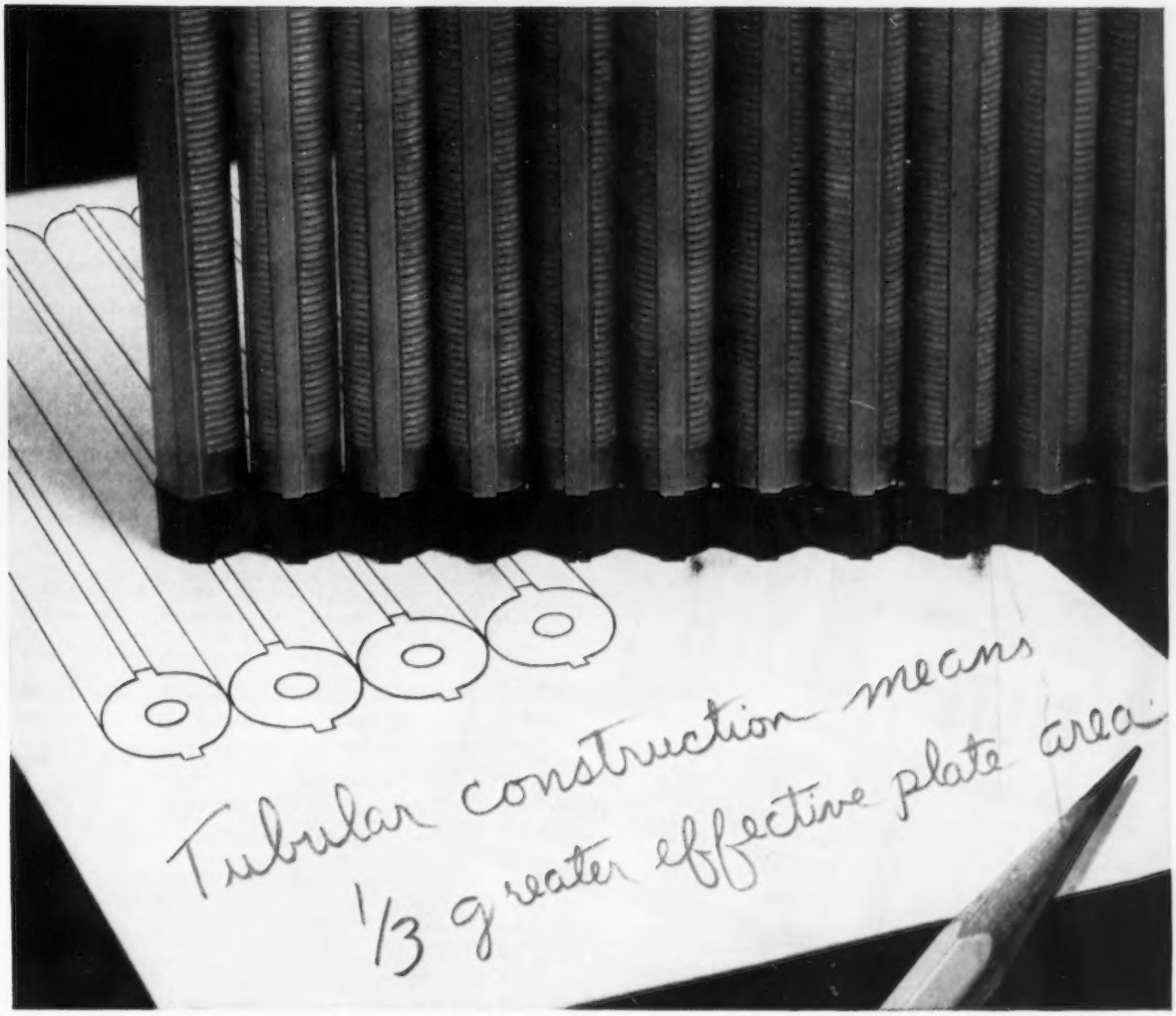
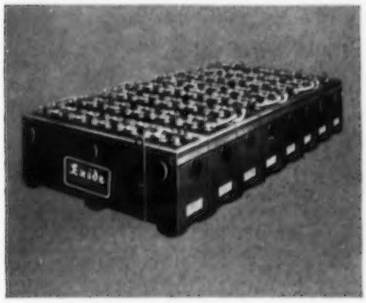


Greater effective plate area boosts power for peak loads



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In the Exide-Ironclad positive plate, active material is held captive in tubes of slotted polyethylene. These tubes are arranged in a tight row with electrical connections only at the top. The actual surface of the plate is the combined semicircular sides of these tubes—the total surface area being roughly one-third more than the projected dimensions of the plate.

In use, this unique design feature means that more active material is exposed to electrolyte for a given size battery. It means the battery can provide power to spare for peak loads as well as a dependable source of continuous power.

Only Exide-Ironclad Batteries have this advantage. Be sure to specify them when you order—for either new equipment or for replacement. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

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Wyoming *(Continued)*

ing border—have shipped commercial grade ore to the AEC buying station at Riverton.

The firms are Pryor Mining Co, Michaud-Lands Group, Bice Mining Co, and the Dean-Coyle-Ferguson Group.

Uranium ore deliveries to the AEC buying station at Riverton climbed to record heights in January despite inclement weather.

Ore came from the Gas Hills area of Fremont County, the Pumpkin Buttes area in southern Johnson and Campbell Counties, and Pryor Mountain near the Montana-Wyoming border.

Largest tonnages were delivered from the Gas Hills area. Vitro Minerals topped the list with 3,500 tons. Other large Gas Hills shippers were Lucky Mc Uranium Corp., Globe Mining Co., and Savannah Construction.

From the Pumpkin Buttes area, San Juan Uranium Co., Denver, and J. L. Masek shipped several loads.

Two shippers delivered ore from the Pryor Mountains. They were Lorin Bice and the firm of Coyle, Ferguson and Dean.

Norman and Robert Harrower, Riverton, have announced sale of 29 Fremont County uranium claims for $1-million. The purchase was made in the name of K. C. Heald of Fort Worth, Tex.

The claims lie in the Crooks Gap area. They brought nearly $34,500 each.

Involved are 24 Sundog claims of the Split Rock Mining Co. and five sun claims held by Crooks Gap Mining Co. The Harrowers control the latter two companies.

Representatives of 18 mining companies have announced plans to create a Wyoming Mining Assn.

Although most of the organizing firms are primarily interested in uranium, other mining concerns will be asked to join.

The group is studying constitution and by-laws of the Colorado and Utah Mining Assns.

When formed, the association is expected to work with the Wyoming legislature's interim committee on a study of the state's mining laws.

San Juan Uranium & Exploration Co., Denver, Colo., has filed about 650 claims on public land in the Pumpkin Buttes Area of north central Wyoming.

The claims were filed with the Pumpkin Buttes Mining Dist. Attorney William E. Foster said San Juan owns or is in the process of buying about 119 already recorded claims located outside the public area.

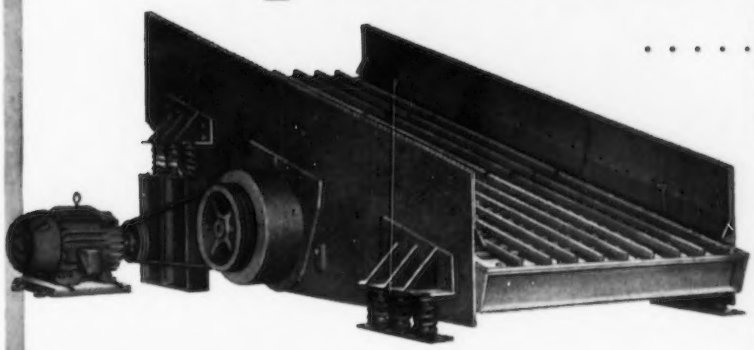
United States Yttrium, Inc., Laramie, has been licensed by the U. S. Atomic Energy Commission to process a limited amount of uranium ore in connection with work at its rare earths plant.

President I. W. Kinney said the license is for processing 370 lb of Samarskite, which runs about 10% uranium oxide.

Kinney said the firm obtained the Samarskite because it has a 20% yttrium content.

Before you buy a heavy-duty scalper...

ask yourself these 4 questions



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Link-Belt heavy-duty scalping screen effectively keeps fines out of primary crushing circuit.

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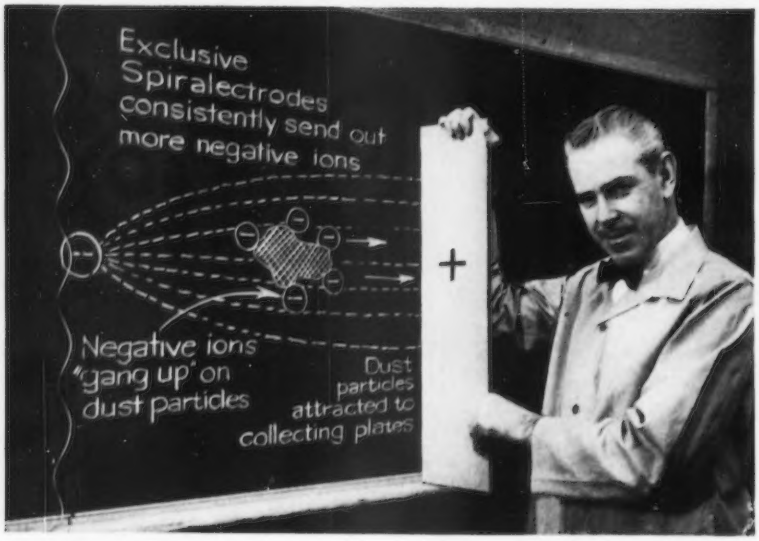
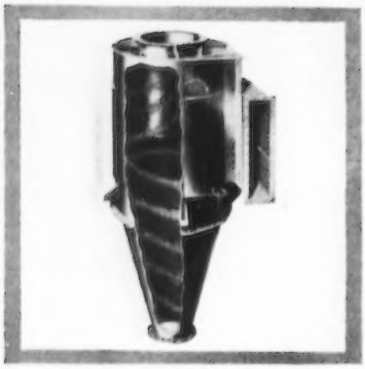
How a Buell Collection System "gangs-up" on dust to meet the toughest air pollution codes


Exclusive Spiralectrodes consistently send out more negative ions
Negative ions "gang up" on dust particles
Dust particles attracted to collecting plates



Buell Cyclones also deliver extra collection efficiency to "gang-up" on dust: Exclusive Shave-off design harnesses double-eddy current and really puts it to work.

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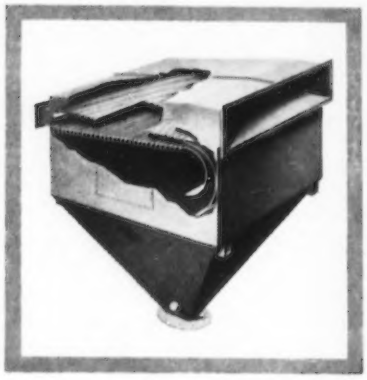

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IN CANADA

NEW BRUNSWICK

Strategic-Udy Metallurgical & Chemical Processes, a new company 80% owned by Stratmat Ltd., the Canadian arm of Strategic Materials Corp., is planning to start construction soon on a million dollar electro-metallurgical plant near Niagara Falls. Company will use the newly developed Udy process for the economic treatment of low grade manganiferous ores. First test run, expected to get started in the mid-summer 1956, will employ low grade manganese-iron ore from Stratmat's New Brunswick deposits.

ONTARIO

Shaft sinking is under way at the copper property of Temagami Mining Co. in the Temagami Lake area. Objective is 550 ft with levels to be developed at 300 and 500 ft. In the meanwhile diamond drilling is being continued. A new high grade lens has been outlined for a length of 100 ft over average width of 25 ft to vertical depth of 120 ft. The zone averages 25% copper across an average width of 10 ft giving a minimum tonnage of 13,000 tons.

Faraday Uranium Mines has secured a premium price contract covering the sale of $29,754,800 worth of high grade uranium concentrates from its Bancroft area property. A contract has been let for a new production sized shaft, which will go down 1,050 ft below the present adit level. Plans call for a 750-tpd capacity mill.

Claim staking records have been broken in Ontario for the third successive year. Preliminary estimate for 1955 gives a total of 57,460 claims, the highest for any province in Canada. Five mining divisions, Port Arthur-Kowkash, Sault Ste. Marie, Sudbury, Eastern Ontario and Kenora, in that order, figured largely in the achievement of the new record.

A total of more than 8.5-million tons, grading slightly above 2.0 lb uranium oxide per ton, have reportedly been indicated by diamond drilling at the Blind River area property of Lake Nordic Uranium Mines. Negotiations for a special price contract are now under way with Eldorado Mining & Refining, the government purchasing agent. Currently two shafts are being sunk and eight drills are in operation in an effort to outline additional tonnage.

Can-Met Explorations, operating in the Blind River uranium area, has added a possible 1.5 to 2-million tons of ore grading close to 0.10% uranium oxide through purchase of 18 claims adjoining its eastern boundary. Property was purchased from Stancan Uranium Corp. The ore represents the eastern extension of the 5-million ton deposit indicated on the Can-Met ground.

(Continued on p 174)

Uranium miner, James T. Gray looks over his Le Roi Model 210 Airmaster compressor, which cost him only 40¢ for repairs last year.

View of James T. Gray's uranium mine located far back on Colorado Plateau. Le Roi Model 210 Airmaster compressor, shown in background, provides air power for operation.

How 55% of Uranium Miners On Colorado Plateau Cut Air-Power Costs

One miner spent only 40¢ on compressor repairs in year.

Use of LPG fuel means additional savings in time and money.

Latest reports show that 55% of the compressors sold on the Colorado Plateau are Le Roi — the dependable air compressor. Le Roi-Cleveland air legs and rock drills were also selected to help keep costs down on most of these uranium projects.

Take the case of miner James T. Gray, for instance. Even though he's a long way back in the mountains, far from repair parts, downtime and distance don't worry him. One reason is that last year he spent only 40 cents for repairs on his major source of power—a Le Roi Model 210 Airmaster Compressor.

Six cents a gallon fuel savings provide another cost-cutting factor at Jim Gray's uranium mine. This large saving is possible because he runs the Le Roi compressor on liquid propane gas. In a year, the six-cents-per-gallon saving grows into a respectable total.

Dependable fuel supply and bulk purchases give miner Gray further dollar savings. To eliminate dangers of being cut off from fuel supply, he installed an LPG storage tank and hooked it directly to the air compressor. Once a month he fills the storage tank with LPG fuel. From this supply, he gets a steady, reliable flow of fuel for at least 30 days — an important advantage on mining projects far back on the craggy, Colorado Plateau. It's time saving, too, because it eliminates the need for daily refueling of the compressor tank.

Both the engine and compressor in the Model 210 Airmaster are manufactured by Le Roi. This assures you complete dependability and more economy. Le Roi Airmaster Compressors also have removable, copper-finned, individual radiator and intercooler core sections, for efficient cooling under all operating conditions. 100% interchangeable valves are readily accessible for quick, easy maintenance.

Le Roi Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin also manufactures Tractair and stationary air compressors, air tools, and engines. Write today for information about any of these products.

C-168

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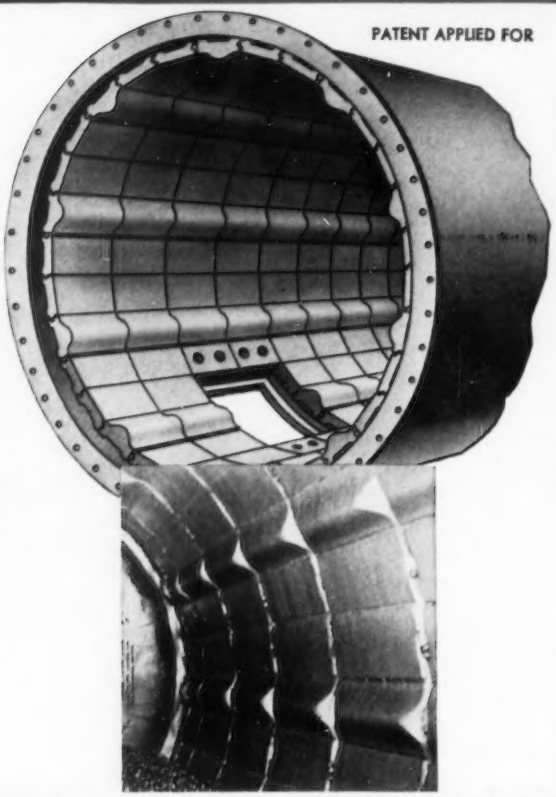

The new B&W Tube Mill Liners have advantages that mean reduced costs in capital, time and labor.

Cost per ton of material ground is reduced, for the practical reasons listed below. Check them—you may find that one, or a combination, of these qualities will solve your existing problems.

- Lower Initial Costs—No pattern and chiller costs —the result of standardization.
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- Longer life for different applications can be realized by a selection of proper materials. This design lends itself to either chilled irons or wear steels.
- Direct labor cost and the "down-time" to install the liners are reduced. Castings are easily handled due to small size and weight. Less fatigue of workers. No cranes needed to handle lightweight liner castings.
- Cost reduced for storage space. Minimum storage space required as small castings "stack" easily. Records simplified with one design of casting interchangeable for all size mills.
- Saves money on liner inventory. One design fits all sizes of mills, permitting standardization. Quicker unloading and storage possible.
- Savings in breakage claims and delays for replacements. Hard brittle irons are frequently broken in shipment when large castings are used. Small castings are rugged and almost impossible to break by handling.
- Savings in determining most efficient wear pattern. Same castings will produce wear profiles consisting of all lifter ribs, all flats or combination of both, including straight or spiralled lifter ribs. Straight or staggered circumferential joints can be used.

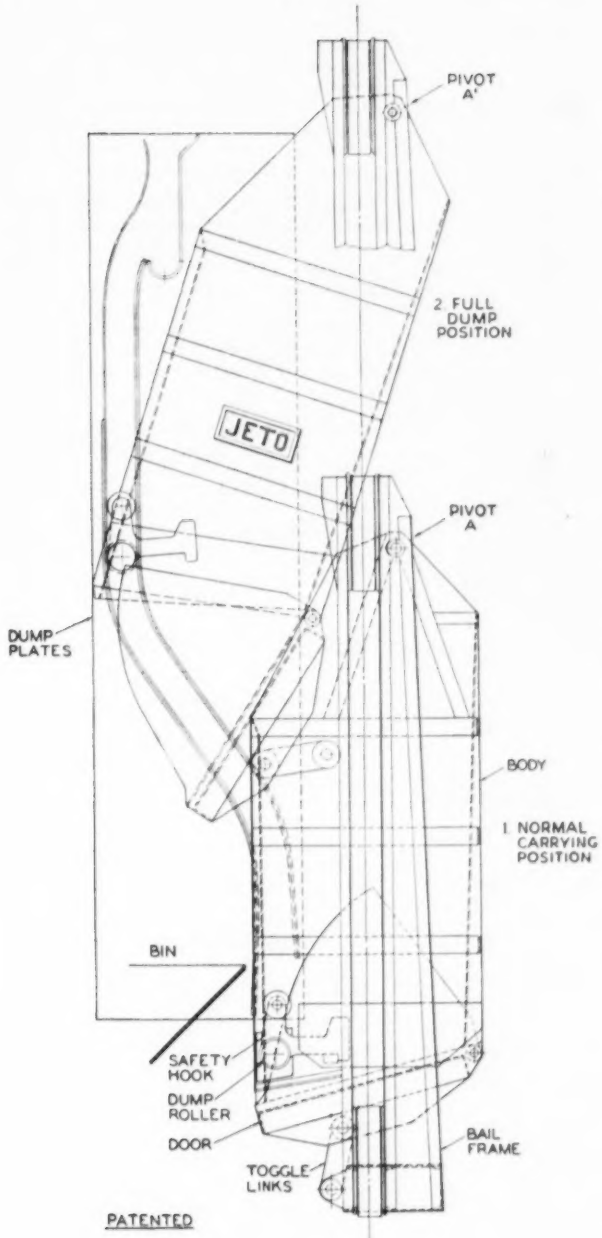
Liners are supplied in two nominal thicknesses, $1\frac{1}{2}$" and 3" with $1\frac{1}{2}$" high lifters. Castings are 6" wide x 12" long. Positive seating of small castings on mill shell means less breakage of castings under operating conditions. For additional information on B&W Universal Tube Mill Liner Plates, write The Babcock & Wilcox Company, Process Equipment Dept., Barberton, Ohio.

BABCOCK & WILCOX

BOILER DIVISION

S-448

Lake Shore's "JETO" bottom dump skip dumps 20% faster — HERE'S HOW IT WORKS



This engineer's drawing shows Lake Shore's "Jeto" bottom dump skip, 1. in normal carrying position, 2. in full dump position. The skip body swings outward from the bail frame on pivot point "A" while toggle links open the bottom door.

How the "Jeto" skip is made

The two principal parts of Lake Shore's "Jeto" bottom dump skip are the bail frame and the body of the skip. They move vertically in the shaft guides. When the dump position is reached, the body swings out and the ore is jetisoned. The dumping mechanism consists of a pair of dump plates (or scrolls) mounted at the dumping station, and dumping rollers, safety hook rollers, toggle door release links, all mounted on the skip.

How it works

As the loaded skip moves into the scrolls, the safety hooks unlock the body from the bail frame, the dump rollers swing the body outward. With the outward movement of the body, toggle links attached to the skip door and the bail frame open the skip door and the ore is dumped. In full dump position, the door is in line with the back of the skip body, and the ore flows unrestricted from the skip. When the skip moves down, the same mechanism closes the door and swings the skip body back into the bail frame.

Why the "Jeto" reduces ore handling costs

"Jeto's" bottom dump is 20% faster than a Kimberly, means more skip loads per day.

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IRON MOUNTAIN 4, MICHIGAN

Ontario *(Continued)*

Nickel Rim Mines is embarking on a program of expansion at its nickel mine in the Sudbury district. The shaft is being deepened to 1500 ft to provide four new levels. Mill is being increased shortly by 10% and cost estimate is being made for doubling present mill capacity of 800 tpd.

Aumacho River Mines continues to add to tonnage in drilling at its lithium prospect in the Georgia-Cosgrave Lakes area. Two parallel dikes have been outlined for combined length of 1,350 ft. Lateral and depth extensions have yet to be delimited. Preliminary estimate, based on 15 holes, shows about 300,000 tons averaging approximately 1.43% lithium ore.

Little Long Lac Gold Mines has acquired control of the veteran Kirkland Lake gold producer, Lake Shore Mines. The late Sir Harry Oakes was the discoverer of the mine and a large block of shares was purchased from Lady Oakes. It is the company's intention to adopt an aggressive policy of exploration together with acquisition and development of new properties.

Coldstream Copper Mines is encountering results in opening the third level at its property, some 80 miles west of Port Arthur. Values ranging from 5%-6% copper across drift width are being obtained. Exploration on the first two levels has been completed for the present. On the first level, a total of 2,754 tons per vertical foot grading 2.17% copper is indicated, while on the second level, a tonnage of 2,500 tons per vertical foot averaging 2% copper is estimated.

Good progress is being made in diamond drilling on the property of Jean Lake Lithium Mines in the Beardmore area. Present work is concentrated on the No. 4 zone, which has been outlined for a length of over 450 ft, widths ranging from 10-18 ft, with good values in lithium oxide. Operations are to be continued throughout the winter.

Siscoe Metals of Ontario, silver-cobalt producer in the Gowganda area, is to open two additional levels in deepening the No. 11 winze to 1,425 ft. Last year the company marked up a new production record with output of over 1-million oz silver. Underground exploration is also being broadened into other areas to investigate a number of interesting indications.

Spanish American Mines is negotiating with Eldorado Mining and Refining for a special price contract for sale of uranium concentrates from its Blind River area property. Plans are being drawn up for a 1,500-ton mill. In the meantime six diamond drill rigs are in operation on a 24-hour basis.

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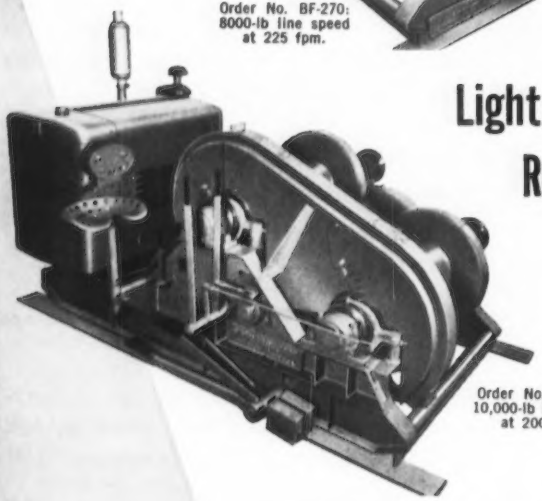

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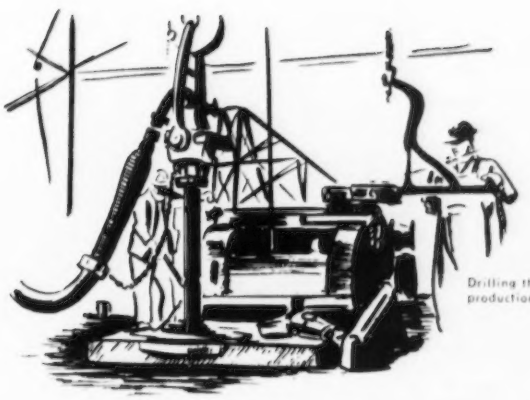
QUEBEC

Chibougamau Explorers, the Anacon Lead Mines operation in the south Chibougamau area, is putting the finishing touches on its 500-ton plant in preparation for regular production. The mine will be the third producer for the area. Provision has been made for easy expansion of the mill to 750 tpd. Grade of ore runs around 0.25 oz gold per ton with little less than 1% copper.

Quebec Chibougamau Goldfields appears to have a good chance to develop a gold-copper orebody of some importance at its Dore Lake Chibougamau property. Drilling in the "A" zone has indicated good copper-gold values with widths in the order of 45-50 ft. Preliminary estimates indicate 2,000 tons vertical ft.

Eldrich Mines is drifting in ore on four levels at its Noranda area gold property. Underground diamond drilling has indicated possibility of a brand new ore zone and drilling is continuing in this zone. From detailed diamond drilling in the immediate shaft area, a minimum of 650,000 tons of ore grading 0.20 oz gold per ton has been estimated to depth of 600 ft. In all, seven levels to depth of 1,015 ft have been established.

Rio Canadian Exploration is obtaining encouraging values in copper, zinc, gold and silver in diamond drilling on its property near Cericy, some 10 miles northeast of Noranda. A large sulphide mass was indicated by geophysical survey and current work is being directed to thoroughly test this structure.



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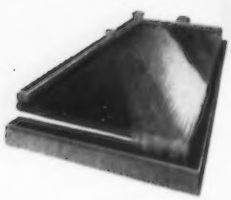

No. 6 Wilfley Table with variable speed V-Belt motor drive.

No. 11-D Wilfley Table showing concrete foundations.

No. 12 Wilfley Table with variable speed V-Belt motor drive.

No. 13 Spec. Wilfley Table with overhead Lamp, as Flotation Pilot Table.

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Quebec *(Continued)*

Eastern Asbestos Co. is to start construction on a 200-ton mill at its Ottawa Valley asbestos property, 24 miles from Buckingham. Pilot plant testing of bulk samples is now under way. Fiber and ore are said to be of the Arizona type, free of magnetite. Underground development continues on four zones outlined to date. Initial mill rate is expected to be around 100 tpd.

Opemiska Copper Mines, which was the first copper producer in the Chibougamau area, is entering its third year of production stronger than ever. Ore reserves have been increased substantially. It is suggested that these are sufficient for 7-8 years on the basis of 800-tpd milling rate to which operations are being increased this spring. A new 1500-ft 4-compartment shaft is to be opened this year, while the No. 1 shaft will probably be deepened.

Campbell Chibougamau Mines is pushing out drives on two levels to open the new "E" zone on the Merrill Island Mining Corp.'s leased area, in the Chibougamau area. Objective is expected to be reached within the next two months. Three holes drilled at the 700-ft horizon indicate a length of 105 ft averaging 32.6 ft in width grading 1.77% copper and 0.018 oz gold.

A length of 160 ft grading 1.507% copper and 0.019 oz gold across a width of 37.3 ft has been indicated directly below by four drill holes.

Obaska Lake Mines is to carry out an exploration program on its recently acquired 10-claim copper prospect in the Chibougamau area. The property is in Scott Twp. some four miles southwest of Chibougamau townsite. A mineralized shear zone has been located and is to be investigated by surface work followed by diamond drilling, if warranted.

Chibougamau Mining & Smelting Co. Inc. is getting under way with a big program of exploration and drilling to explore its extensive holdings in the Chibougamau area. The program calls for use of five drills for an initial 30,000 ft of diamond drilling. A total of 805 claims is held in 24 separate groups extending through the heart of the district in the vicinity of David Lake, Dore Lake and Lake Chibougamau.

Rainville Mines Ltd. is aiming for production at its copper property in the Val d'Or area by mid-April. Initial milling rate is to be 300 tpd with provisions made for easy increase to double that tonnage. Initial production will come from the No. 4 zone, developed to the 550-ft level, which is estimated to have 352,000 tons averaging 2.32% copper in seven oreshoots. A large tonnage has also been indicated in the No. 2 zone with grade expected to average around 1.5% copper.

ALBERTA

Commercial ore for a 50-ft average depth has been indicated by four additional

(Continued on p 180)

DOW

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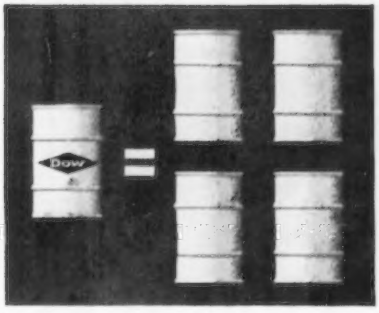

Money-saving arithmetic. One gram of Dowfroth 250 can equal four of other frothers on your ore. Dowfroth 250 also has definite uniformity of properties and is readily available in drum or tank-car quantities.

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The man in the mill—because the action of Dowfroth 250 is rapid and under control—because Dowfroth gives concentrate froths that are easy to launder, pump and thicken—because Dowfroth doesn't deteriorate rubber parts—is pleasant to handle.

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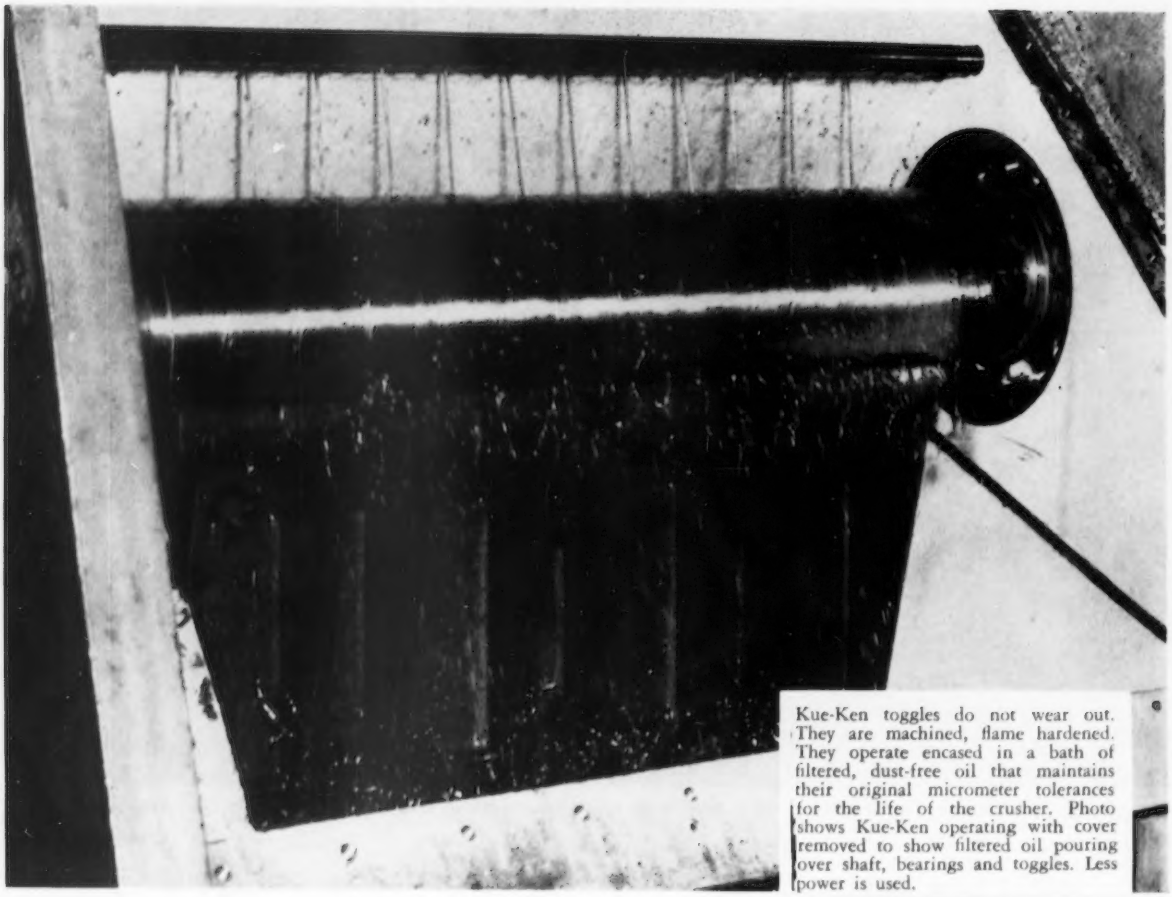

Kue-Ken toggles do not wear out. They are machined, flame hardened. They operate encased in a bath of filtered, dust-free oil that maintains their original micrometer tolerances for the life of the crusher. Photo shows Kue-Ken operating with cover removed to show filtered oil pouring over shaft, bearings and toggles. Less power is used.

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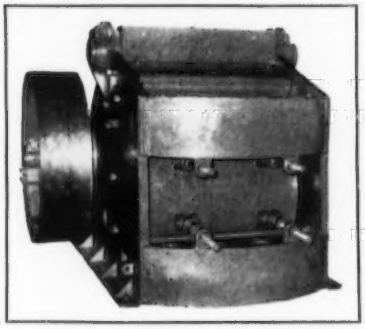

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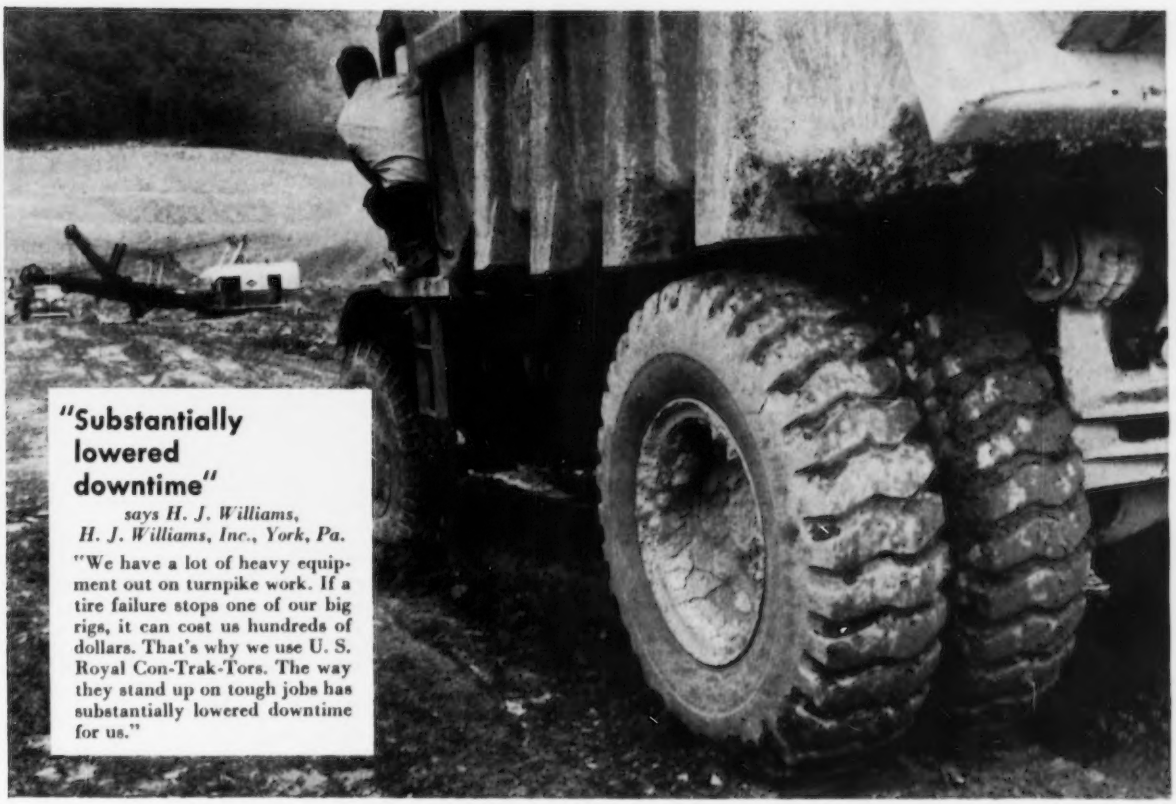
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Alberta *(Continued)*

holes drilled in the Kamloops copper property of Commercial Minerals Ltd.

The announcement was made in a statement released by directors of the Edmonton based firm.

The total five holes have proven reserves of approximately 30,000 tons of copper-silver-gold ore, the announcement said.

Three crews are engaged in drilling to explore extensive reserves indicated by surface work. The firm plans to prove as large a body as possible by drilling before it reaches a decision on the size of a mill.

Henry L. Hill, consulting mining engineer, has advised the company that in view of the ideal location as regards transportation and power, mining and milling costs may be as low as $2 per ton.

MANITOBA

Copperman Mines Ltd. announces plans for 5,000 ft of diamond drilling on its copper-zinc property in the Herb Lake area. Previous drilling in 1952 indicated three mineralized zones having interesting copper-zinc values over mineable widths.

Green Bay Uranium Limited reports 5,000 ft of diamond drilling to be carried out this winter on its lithium prospect in the Herb Lake area. Company holds 32 claims on which preliminary exploration revealed several interesting lithium showings with samples running 2% Li_2O.

Montgary Explorations Ltd. reports diamond drilling on the Bernic Lake lithium property will be resumed this winter. Previous drilling indicated 2-million tons grading 1.5% lithium oxide.

BRITISH COLUMBIA

Vancouver Branch of the Canadian Institute of Mining and Metallurgy has elected R. W. Wilson its chairman for 1956.

Wilson, managing director of Silver Standard Mines Ltd., succeeds Robert P. King, resident engineer at Vancouver for B. C. Department of Mines.

B. O. Brynelsen, western manager of Noranda Exploration Co. Ltd., and S. M. Manning of Technical Mine Consultants Ltd., have been named first and second vice-chairman, respectively, and Fred H. Stephens was re-elected secretary-treasurer for the 15th year.

Ottawa Silver Mining Co. reports "an unusually rich strike" of silver ore on its property at Slocan City, where a discovery of high-grade silver ore above an old stope of the mine has been opened up.

A raise from the old workings contacted the new ore about 200 ft above the No. 8 level of the mine. The stope from which the raise was started yielded about $90,000 worth of silver ore in 1951, and work at the property was started again last fall. The new ore is being stockpiled for shipping when weather conditions permit.

A three-fold increase over 1955 earnings representing a $2-million net profit, has been estimated for British Columbia's Cassiar Asbestos Corp. Ltd., according to a report by president F. M. Connell on the company's operation.

A general upgrading in asbestos price has bulwarked Cassiar's competitive position, and the company has produced two new grades of asbestos which is expected to increase earnings.

One of the new fibers, AAA grade, is tentatively priced at $750 a ton and the other, AC fiber, at $300 a ton. Cassiar at present plans to produce about 1,000 tons of grade AAA. Average mill production now is 500 tpd which will be maintained until June. The mine is now equipped with modern laboratory and testing apparatus.

Plans for the Canadian uranium program of financier Floyd B. Odlum's Federal Uranium Corp. were announced at the annual meeting of Great Northern Uranium Exploration Co., in Vancouver in January.

Great Northern is the B. C. company selected by Odlum to handle the Canadian end of his uranium interests.

Total of $3-million will be put into Federal's treasury, a goodly portion of which will be funnelled into the Beaver Lodge uranium properties in Saskatchewan.

W. D. Nebeker Jr. of Salt Lake, president of Federal, and J. I. Kyle of Van-

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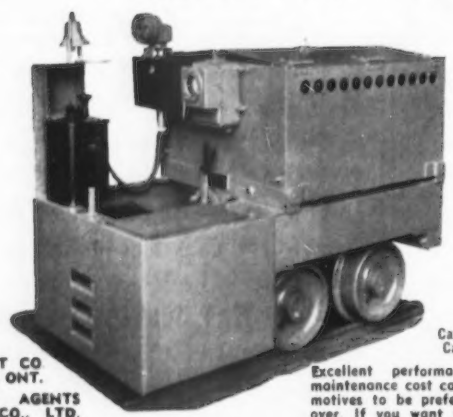

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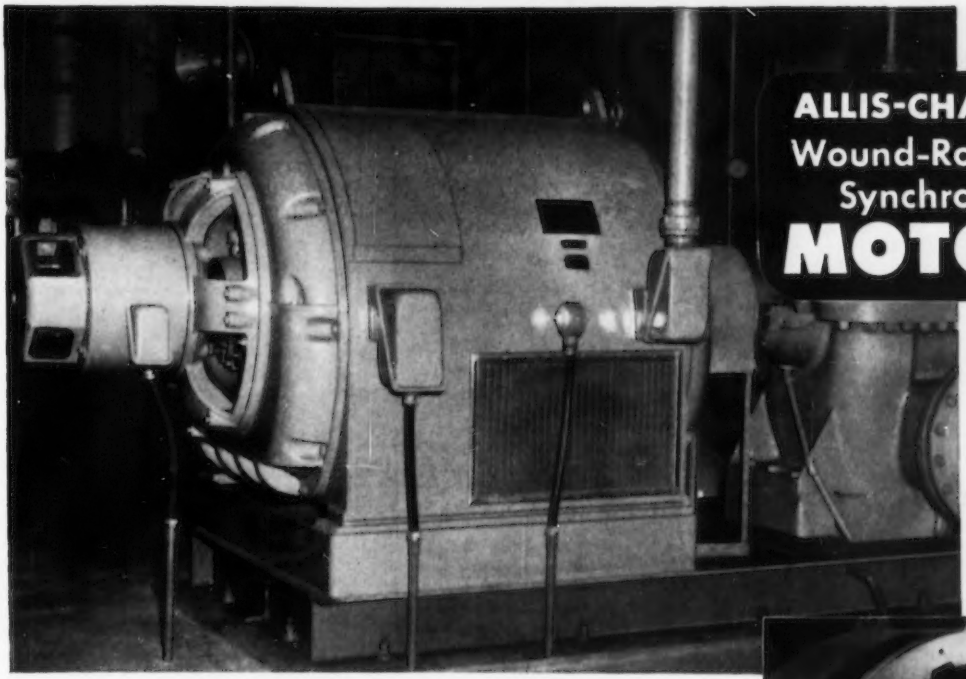

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59 Years of Experience

British Columbia *(Continued)*

couver, president of Great Northern, made the announcement of the Canadian plans at the meeting.

Nebeker, stressing his belief that demand for uranium will continue strong, felt that the uranium mining industry is emerging from its early promotional stage and that new opportunities will be available for soundly-financed, efficient companies.

Uranium is Odlum's key interest at the moment, but his spokesmen make it clear that the door is not closed to other mining fields.

The program would have been announced last year but was delayed by a lawsuit involving a Utah uranium holding of Federal.

Copper-mining activities have mounted to a new peak of interest and news of the burgeoning Highland Valley area continues to dominate the British Columbia mining scene.

New companies are being formed, share trading deals are on between companies seeking to participate in the development, and transfers of claims parcels are common as companies on the spot maneuver for specific areas.

In fact, general increase in actual drilling and development programs is noted throughout the province, in the wake of a U.S. forecast that the current copper shortage would continue through 1956, and announcement that a $3½-million copper mill will be built in the Vancouver area, by newly-formed Western Copper Mills Ltd., headed by industrialist Richard M. Reiner.

"It is the first of its type to be established in Western Canada," stated Reiner.

The new mill will produce seamless copper tubing and pipe; busbars, rectangular and round, for the electrical industry; miscellaneous products such as copper wire rods and round stock. It will have a capacity of 675 tons per month.

Initial markets for production will be B. C. and Western Canada, with some exports to the Western U.S.

Reiner said he will draw on B. C.'s mineral resources for raw material, but would not reveal where he planned to have the raw material refined.

(Closest refinery is American Smelting & Refining Co. at Tacoma, Wash., but that plant is operating at capacity to supply its present customers. Anaconda in Montana is the only other copper smelter anywhere near British Columbia and it, too, is carrying a full load.)

The copper mill will rate as a key fabricating industry in view of the expanding construction activity in B. C.

Other salient developments which highlighted the copper situation in B. C. were:

(1) Officials of Mid-West Copper Co.'s Velvet Mine (located about 15 miles from Cominco's Trail operation), report metallurgical tests of bulk samples of surface dump proves up a gross value of $55 per ton of concentrate, bringing the value of its 15,000-ton dump to $250,000.

Dr. G. A. Pentland, geological engineer and a Mid-West director, has taken over full charge of the mine's engineering and geological work to speed up development of the 7 level where 30,000 tons of high-grade ore with $1.5-million gross value is stockpiled for milling.

(2) New company called Makaoo Development Co. Ltd. has moved on to a 68-claim property in the Kamloops area and is exploring to prove-up a copper mine there.

Consolidated Mining & Smelting holds the claims adjoining Makaoo to the south and last season carried out extensive diamond drilling just 2 miles south of the old workings currently being reopened and extended by Makaoo.

B. C. mining engineer Waller I. Nelson heads the company. Martin B. Johnson of Moorhead, Minn. is vice president, and directors are W. Fred Evans, Dr. Lorne G. Wood, Samuel Semple; Norman L. Harvey is treasurer and C. George Robson, secretary, all of Vancouver.

(3) Three-shift diamond drilling is under way on the newly-acquired 97-claim property of Commercial Minerals Ltd. of Edmonton, 10 miles south of Kamloops.

Core of the holdings is the Ray group of 22 claims where the host rock has revealed consistently high copper values.

M. J. Pritchard, president and managing director announced that Jack A. Russel has been added to the board of directors. According to Henry L. Hill, consulting engineer, results of assays show an average thickness of 23 ft, grading gold and 0.10 oz silver per ton, with 0.80% copper in a flat-lying deposit

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10. Tubular steel derrick.
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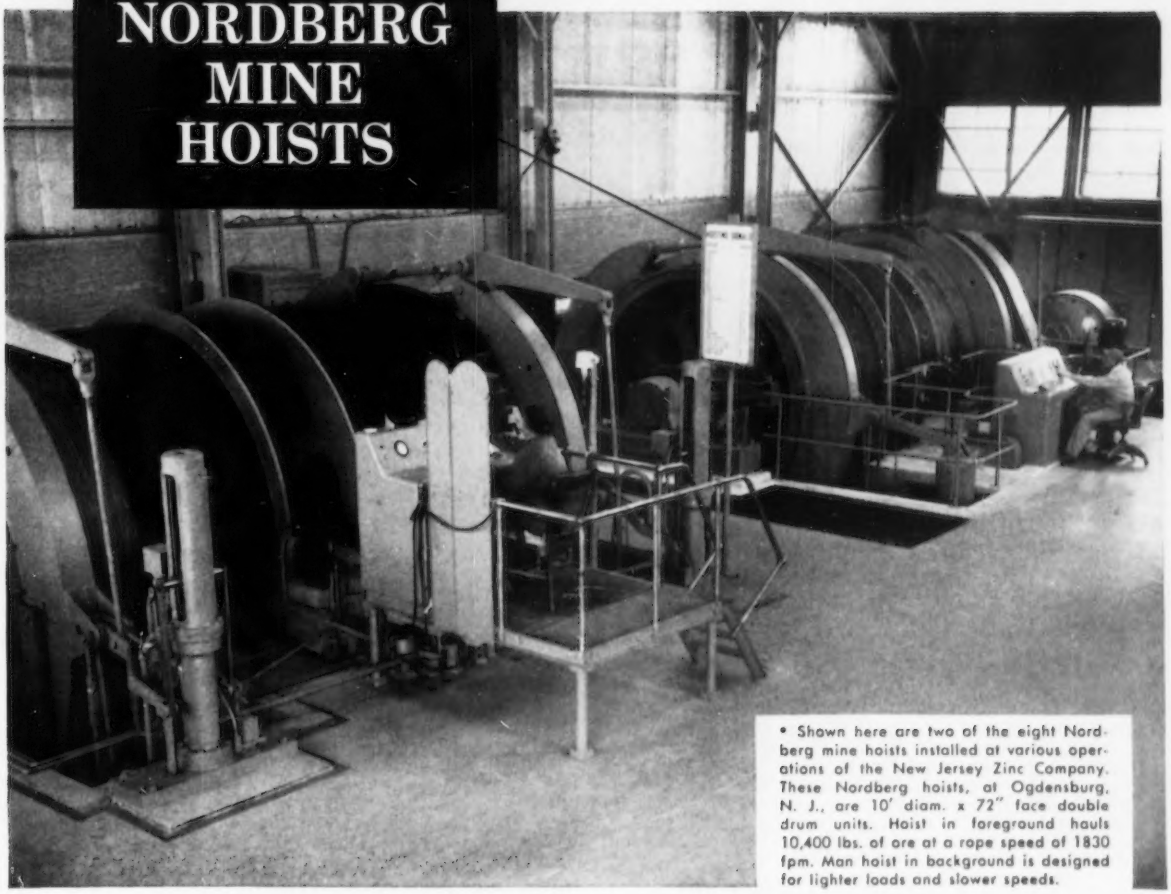
NORDBERG MINE HOISTS



• Shown here are two of the eight Nordberg mine hoists installed at various operations of the New Jersey Zinc Company. These Nordberg hoists, at Ogdensburg, N. J., are 10' diam. x 72" face double drum units. Hoist in foreground hauls 10,400 lbs. of ore at a rope speed of 1830 fpm. Man hoist in background is designed for lighter loads and slower speeds.

. . . Standard of the Mining Industry

For over 50 years, Nordberg has specialized in building large or unusual hoists to specification, and is the source of the most progressive hoist engineering advances in the mining industry. The most modern tools, skilled craftsmen, and a widely experienced engineering staff combine to produce mine hoists which enjoy an unexcelled reputation for safe and dependable operation throughout the world.

With the trend toward larger tonnages and more powerful hoists, greater emphasis than ever is being placed on the design ability of hoist manufacturers. Here Nordberg has achieved consistent success and is today in the position to build both conventional and friction type hoists according to the requirements of the mining industry.

Write for further details, or ask for Bulletin 190. *NORDBERG MFG. CO., Milwaukee, Wisconsin.*

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MH156

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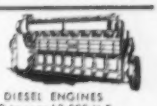
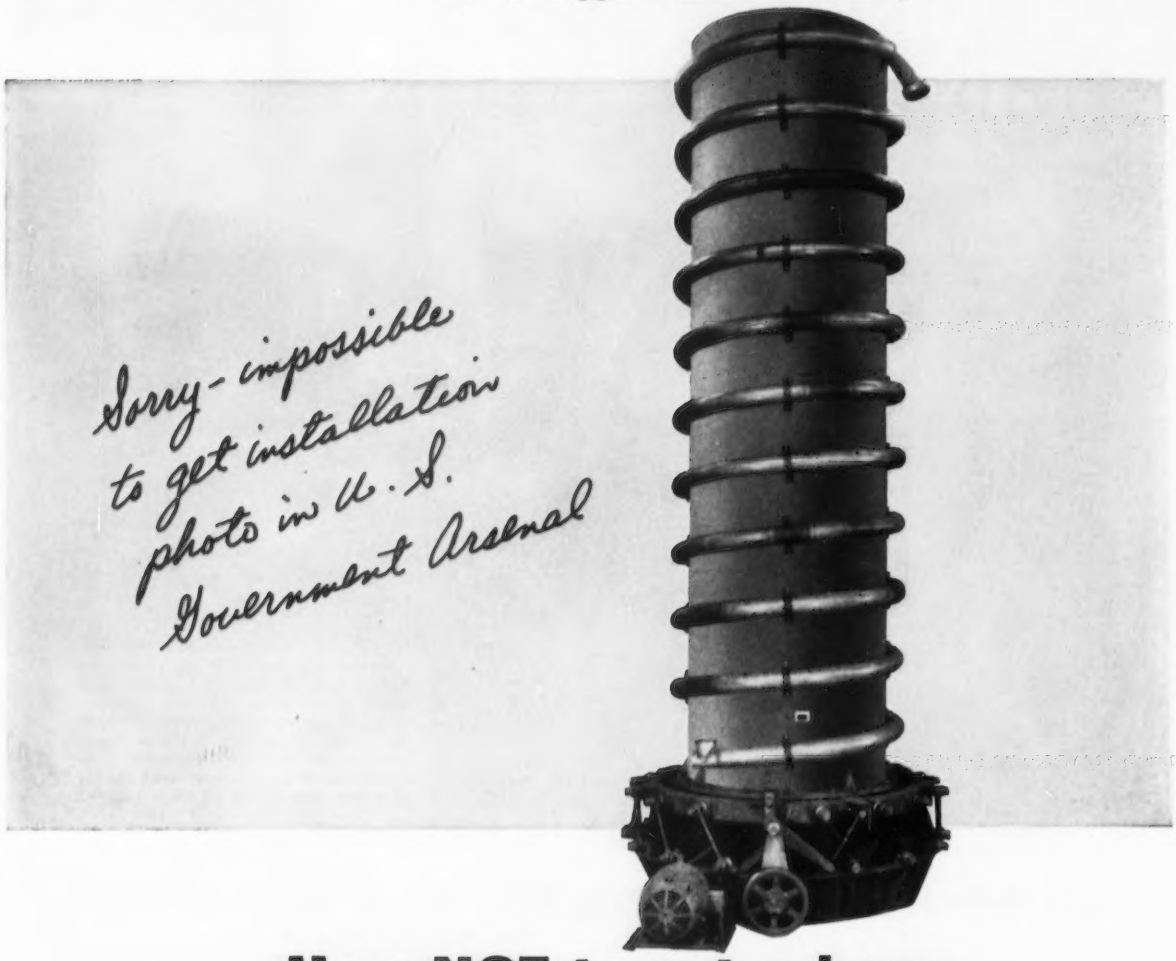


DIESEL ENGINES 10 to over 12,000 H.P.

CARRIER *does the "IMPOSSIBLE" for the biggest names in industry!*



How NOT to get a bang out of rocket fuel powder

YOU can't see it—but super-dangerous rocket fuel powder is what's conveyed inside that spiralling tube. It used to be handled by screw conveyors and bucket elevators. Catch was that the powder sometimes came in contact with oil or grease, causing violent explosions.

After several of these dangerous explosions had caused heavy damages, Carrier was called in. Within a month, Carrier engineers had come up with the answer in the special Spiral Natural-Frequency Conveyor shown above.

It's stainless-steel throughout, with totally-enclosed conveying tube. It's grounded, air-tight and self-cleaning. It vibrates the powder gently, quickly and safely to the top discharge where it's fed onto another Carrier Natural-Frequency Conveyor—a covered, horizontal unit that's also stainless-steel, air-tight and grounded. The whole operation is now quicker, cleaner and more efficient. Most important, of course, *danger has been minimized!*

Chances are that danger isn't the big headache in your operation. But whatever it is—if it involves handling and processing, Carrier Natural-Frequency Vibrating Equipment may be the answer. Remember — Carrier developed the world's first really modern vibrating equipment . . . knows more about its *practical* industrial applications than anyone else. May we talk with you soon?

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~~NATURAL-FREQUENCY~~
CONVEYORS

Carrier Conveyor Corp., 203 North Jackson St., Louisville 2, Ky.

For the Maximum in Dust Recovery...

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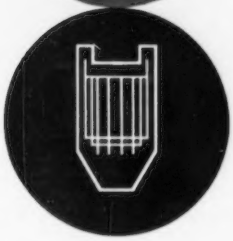
WESTERN PRECIPITATION

The only organization with 48 years of dust collection experience.

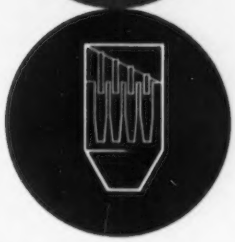
ELECTRICAL, MECHANICAL and FILTER types of recovery systems.

COTTRELL Electrical PRECIPITATORS



Western Precipitation pioneered commercial application of the now-famous Cottrell **Electrical** Precipitator—has more know-how, more experience, more basic advancements in this highly-technical electrostatic field of recovery than any other organization, domestic or foreign.

MULTICLONE Mechanical COLLECTORS

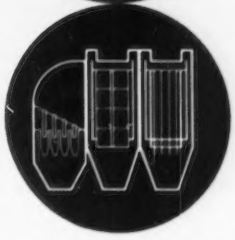


Western Precipitation pioneered the multiple tube type of cyclonic collector—the type with higher centrifugal forces for greater recovery efficiencies. Multiclones are also easier to install, service and maintain—and require less space than other equipment of comparable capacity.

DUALAIRE Reverse Jet COLLECTORS

This is the filter-type recovery unit that continuously and automatically maintains filter porosity with virtually the entire filter area in service as it filters the gas. Cleans without jarring or rapping... pressure drop remains uniformly low, filter capacity remains uniformly high because no thick filter cake ever forms to reduce effectiveness. Actual field tests show collection efficiencies higher than 99.99%.

ALSO... Combination SYSTEMS



A Combination Multiclone and Precipitator (CMP), for example, combines in one compact unit the advantages of the Multiclone for removing the heavier particles (down to a few microns in size) and the advantages of the Precipitator for final clean-up. Result—high overall recovery efficiency at very nominal overall cost—almost constant collection efficiency despite varying gas volume.

Let us send you literature which describes Western Precipitation's unique services in greater detail. Write, wire or phone our office nearest you!

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Reverse-Jet Filters
HOLO-FLITE Processors

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BIN STUCK LATELY?

There are two ways to handle a stuck bin. You can bang it loose with a sledge hammer, and damage your equipment; or you can install Cleveland Vibrators and put an end to your problem. The first way is slow and costly. But the second way is efficient, fast, and inexpensive.

How about you! Are your schedules suffering from stuck bins? The low cost of Cleveland Vibrators will surprise you, and the results will definitely please you. Why not get the whole story with a two-cent post card.

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British Columbia *(Continued)*

15 to 20 ft below the surface, the ore having a gross value of $7.32 per ton and net smelter returns of $6.02 anticipated after inclusion of freight charges. He estimates total mining and milling costs at $2.00 per ton at a rate of 500 to 1,000 tpd.

"Due to the fact that copper occurs as high-grade copper minerals, chalcocite and native copper, a concentration grading 60% is anticipated. Most copper properties produce a 25 to 28% concentrate due to the fact that copper occurs as the low-grade copper minerals chalcopyrite," Hill states.

(4) Another new B. C. company, Trisides Mining Corp. Ltd. (with about $300,000 going into its treasury), is moving into the copper-rich Highland Valley to explore three groups of claims it holds adjacent to Trojan, Beaver Lake and Jackson Basin.

President of Trisides is A. J. McLellan of Vancouver, and Howard T. James and Chris Riley will be in charge of technical direction.

Initial exploration program calls for an expenditure of $100,000. This will include investigation of the north group which adjoins the Krain property of Beaver Lodge Uranium Mines; the claims carrying the southwest extension of Trojan's known mineralized zone; and the third group which ties in with certain of the occurrences on the Jackson Basin Mines property.

(5) Diamond drilling program of Trojan Exploration Ltd. now is under way in the Highland Valley, with an estimated 100,000 ft of drilling required to outline the copper ore zone sufficiently to determine future production plans. This is four times the amount of drilling previously under consideration.

(6) Farwest Tungsten Copper Mines in a 50-50 association with Beaver Lodge Uranium Mines Ltd. is proceeding with plans to explore their holdings in the Highland Valley copper area.

They have announced they are forming separate companies to explore and develop different groups of their jointly-owned 170 claims in the area.

Farwest and Beaver Lodge are sharing equally in 86⅔% of a new company to be formed to expedite development of the "Krain" group of 20 claims.

Another 34 claims will be transferred to an Ontario company to be known as North Lodge Copper Corp. Ltd. in which Farwest Tungsten and Beaver Lodge will hold part interest.

The remaining 116 claims at Highland Valley will be developed either by Farwest Tungsten and Beaver Lodge Uranium or by new companies in which substantial interests will be retained by the present joint holders.

Farwest president D. F. Harris said: "It is not our intention to sell any of them outright, but, rather, to let the new companies put up the funds and to keep a substantial interest in each of these ventures."

And Beaver Lodge had the deepest test hole in Highland Valley area. At the end of January it was down 530 ft and still in mineralization.

(7) Ainsworth Base Metals Ltd. has staked an additional 16 claims in the Highland Valley, also adjacent to Trojan, Trisides, Farwest Tungsten and Jackson Basin, and managing director H. F. Kenward reports good initial results from sampling at its optioned property there.

(8) Cassiar Consolidated Mines Ltd. also has expanded its Highland Valley holdings by adding the Cas group to the Jerusalem group, with the two holdings now including 45 adjoining claims directly south of the Bethlehem Copper property.

Bunker Hill & Sullivan Mining & Concentrating Co. has taken options to purchase 53 zinc-lead claims in the southeastern part of the province, north of Kaslo. It is the big Idaho company's first entry into the B. C. mining fields.

Claims, located on the east side of Duncan Lake about 30 miles north of Kaslo, were optioned from Joe Gallo and associates of Howser, B. C.

Bunker Hill's exploration staff made a preliminary examination of the property last fall. Diamond drilling and possibly other exploration work are planned this summer.

IN AUSTRALIA

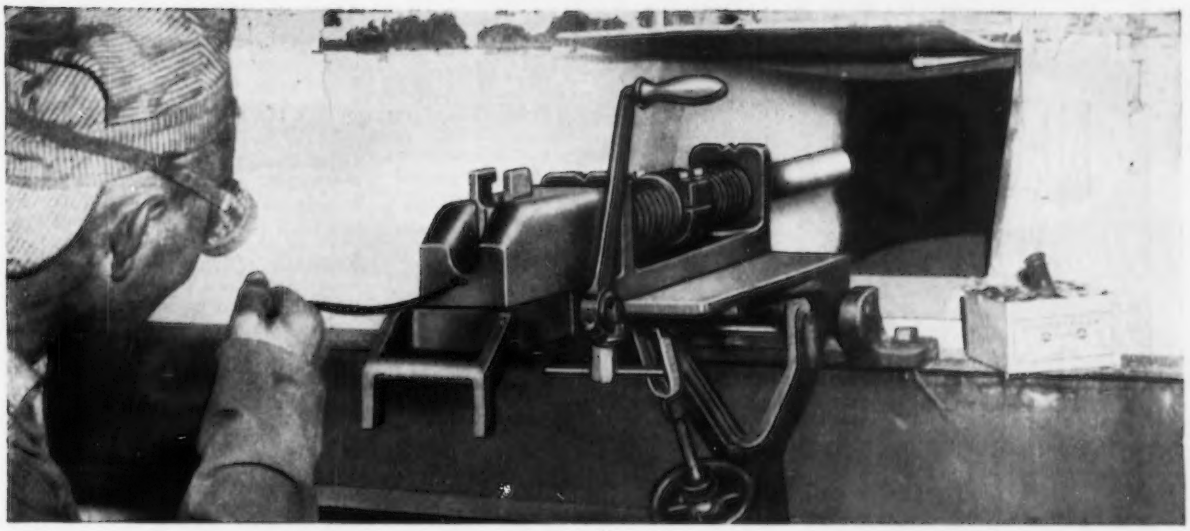
A new uranium treatment plant, to cost over $20-million, is to be erected on the Mary Kathleen uranium lease at Mt. Isa and Rio Tinto, the well-known British mining organization, will control the new undertaking. Most of the equipment will be purchased in the United Kingdom; actual production is not expected before 1959. Original plans provided for a substantially smaller plant but Rio Tinto is understood to have insisted on a larger plant.

The proposed construction of this plant will provide an incentive for further prospecting & mining operations near Mt. Isa where some efforts have been hampered by the distance from the existing treatment plant at Rum Jungle.

Another large plant is being proposed by Mt. Isa Mines Ltd., in which American Smelting & Refining Co. holds an interest. A $5-million copper refinery is considered by this company with location at Stuart, about 6 miles from Townsville in Queensland. Blister copper will be sent by rail in one-ton slabs from Mt. Isa to the proposed refinery.

Broken Hill Associated Smelters Pty. Ltd. of Port Pirie, in which Consolidated Zinc, North Broken Hill and Broken Hill South are partners, is considering the treatment of 4-million tons of slag dump for the recovery of zinc. It is estimated that the dump contains at least 750,000 tons of zinc. No date for the commencement of these operations is given and it is somewhat doubtful whether they would start in 1956.

Lennox Head Co. has commenced pro-



Time cut 112 to 1 in removing kiln rings with the REMINGTON INDUSTRIAL GUN

VARIOUS MOUNTINGS ARE POSSIBLE with the Industrial Gun. Here's one of the most common: secure a 6" or 8" "I" beam across the face of the kiln and simply hook the mount into the bolster. The gun can also be mounted on a truck, a tripod, or a mobile chassis for shooting down obstructions in mines or quarries.

26 hours per month production time gained by refractory plant

"We save 222 man-hours per month—and gain 26 hours' production time!" That's how the superintendent of a large refractory plant in Georgia sums up the reasons he's sold on the Remington Industrial Gun. Formerly, removal of kiln rings took 8 men an average of 28 hours per month. Two men now do the same job *in one hour*.

Hundreds of plants have found the industrial gun to be the fastest, most efficient method for ring removal. In seconds, one man can aim, load and fire the gun. A few shots loosen the ring . . . cause it to crumble when the kiln is rotated. There's never any need to cool and reheat the kiln. *Downtime is cut to a minimum!*

Use of the Remington Industrial Gun can mean big savings in labor, big gains in production for you. Our technicians will be glad to work with you on ring-removal problems at your plant. Just send the coupon for a free illustrated folder with complete information.

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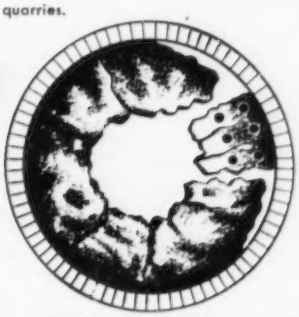
REMINGTON INDUSTRIAL SHELLS have tremendous smashing power. They're loaded with a powerful 3-ounce lead projectile that develops 7,475 foot-pounds' muzzle energy.



CUTTING A "KEY-WAY." A few well-placed shots loosen a section of clinker. The ring is weakened by this loss of the arch key . . . will usually fall without additional shots when the kiln is rotated.

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AMERICAN BRATTICE CLOTH CORP.
220 Buffalo St., Warsaw, Indiana

Australia *(Continued)*

duction at the mineral sands area near Lennox Head in New South Wales. Good progress was made in the erection of plant and buildings and, like most of the other Australian rutile producers, the company has already sold its anticipated next few years' production at a satisfactory price.

High values are disclosed in a diamond drilling report by Australian Development N.L. In diamond drill hole No. 54 (305 ft level) values were 242 dwts from 64 to 69½ ft. Only 2 in. of the core recovered showed free gold.

New mill of Northern Hercules N.L. is now in operation. The mill has started to treat about 3,000 tons of mixed ore and development dirt. Underground output of about 50 tpd will be stepped up to 100 tpd within a few months. Stope stripping has indicated increasing widths of ore in No. 2 level. At 10 ft north of the branch drive, stripping **has disclosed** an additional 51.3 dwt over 45 in. making a total of 36.8 dwt over 92 in. A total of 16.6 dwt over 90 in. has been assayed at 15 ft N. and 17.2 dwt over 81 in. at 20 ft N.

Coal shortage resulting from an overtime ban of railroad workers, forced the curtailment of operations of Mt. Isa Mines and led to a production loss of 1800 tons of copper and 3600 tons of lead. The smelters are now working to capacity.

Mining Corporation N.L. has obtained 1.8 and 1.6% cobalt assays 300 ft north of the old Mt. Cobalt mine. The assays came from No. 4 and 5 hole and No. 6 hole is now in progress about 800 ft north of the mine. A wide body of mineralization was disclosed within which the Mt. Cobalt lode is continuing northwards.

Mineral sands company preparing to start production, Western Titanium N.L., has extended its freehold areas by acquisition of Davies Block which is estimated to contain about 750,000 tons of heavy minerals. Progress has been made with the design of the proposed treatment plant. Rutile-bearing sands have also been discovered north and south of Maroochydore in Queensland where drilling will be undertaken by Australian Oil Exploration Ltd.

Hatches Creek South Syndicate N.L. has been formed to develop the Hit or Miss mine and other leases in the Northern Territory for the production of wolfram.

Australian Uranium Corp. N.L. has found "a mineralization of great importance" in its No. 5 shaft and thinks that original estimates of tonnage of ore will be substantially exceeded. Planned development includes the proving of the White lode by underground drilling from the new levels of No. 1 shaft and surface drilling to intersect the ore zone in addition to further exploration of the Black Lode beyond No. 5 shaft.

Initially the main shaft will be sunk to 600 ft. Recent assays of ore parcels from the Adelaide River mine showed 1.52% uranium oxide which was an improvement on previous 0.4 and 0.6%. High grade uranium mineralization was also discovered at 382 ft at the Adelaide River mine. This development represents an additional vertical extension of the orebody by more than 200 ft.

Great Boulder Pty. Ltd., the West Australian gold producer, improved production figures by 7,587 fine oz in the year ended Dec. 31. The new figure was 115,586 oz. Short tons treated rose from 470,914 to 473,288. Latest development report from Great Boulder says that the Edwardian shaft, at the 2050 ft level, produced an average of 13.8 dwt over 5 ft with a length of 44½ ft. At the 2200 ft level, 10 ft averaged 12 dwt over 6 ft. Best value in the main shaft was at 1930 ft level where 55 ft averaged 12.7 dwt over 6 ft. Development footage for 1955 was 16,427 ft against 19,555 ft in the previous year.

Net profit of Norseman Gold Mines N.L. in its last fiscal year rose from £A47,098 to £A49,820. This was after considerable increases in provisions for depreciation and taxation. Treatment costs were expected to be lower in the current year and underground mechanization resulted in substantially lower costs of ore breaking in the pyrites section.

Treating a smaller tonnage of ore in the quarter ended Dec. 31, Mt. Lyell Mining Co. produced 1,088 tons less of copper and 243 oz less gold. The furnace ran only 55 days against 70 days in 1954.

United Uranium N.L. has found appreciable traces of gold at El Sharana. Results of recent 20 assays were from El Sharana No. 1 shaft workings and ranged up to 1 oz 13 dwt gold. The average was 5.1 dwt a ton. Uranium content of the samples averages 2.74% a ton. The shaft at Koolpin Creek has been sunk about 40 ft in promising lode material.

IN THE PHILIPPINES

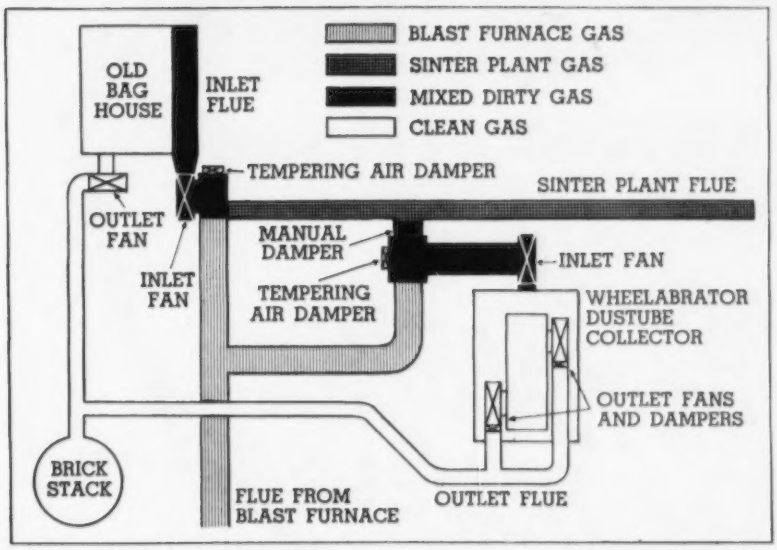
Atlas Consolidated Mining & Development Corp. announced December output of 130,564 tons milled was the highest since its start of operations on the Toledo mine. The current high copper price makes milling profitable of low grade oxidized ore instead of discarding it as waste. Because of its inclusion with mine run ore, the average grade of ore milled declined to 0.69% copper. Concentrates produced during the month totalled 3,290 tons of 21.4% copper. Shipments made to Japan totalled 945 tons copper content.

Lepanto Consolidated Produced 4522 tons copper concentrates averaging 21% copper and 0.7 oz gold per ton. Ore milled totalled 36,380 tons, averaging 2.79% copper and 0.116 oz gold per ton. Copper recovery was 94% and gold 81%. Mill heads in December were considerably lower than the average.

(Continued on p 192)

DUST and FUME topics

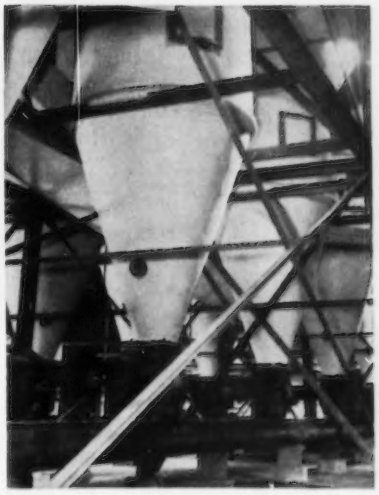
WHEELABRATOR CORPORATION Mishawaka, Indiana



NO AIR POLLUTION HERE! Dust and fume controlled at lead smelter

Expansion of sintering facilities and intake of lead at a prominent lead smelter necessitated additional smoke filtration facilities. After visiting other smelters and investigating various makes of dust collectors, plant officials selected a Wheelabrator Dustube Collector with Orlon fabric filter tubes.

As shown in the flow chart above, the Wheelabrator Collector filters flue gas from sintering machines and blast furnaces. In this continuous automatic installation the collected material is returned to the sintering plant where it is reused. Collecting efficiencies above 99% are uniformly obtained — cloth filtration is the oldest and most reliable method for removing solid contaminants from air or other gases.



Flexibility permits custom designing to fit the job

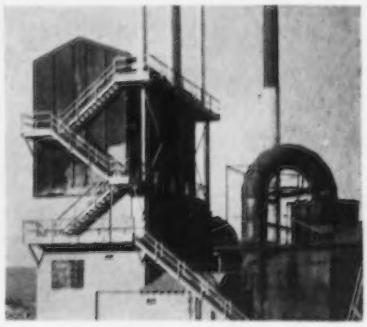
Wheelabrator Dustube Collectors can be designed to fit existing or new plant buildings, flue lines and ground contours. Various arrangements of hoppers and discharge mechanisms are available. They can provide continuous, severe service with a minimum of downtime and automatic units can be designed to permit interior inspection and maintenance without shutting down.

How to Save Money in the Metallurgical and Mining Industries

Wheelabrator Dustube dust collection systems provide an easy, low-cost way to salvage all the dust created in your operations. They permit you to recover valuable material, better working conditions and improve relations with the rest of your community. Investigate the details of design, operation and construction that bring all of these advantages to you. Send today for Bulletin No. 372-C.

No Downtime for Shaking or Dust Disposal

Gases from a sintering machine are effectively filtered at 25,000 cfm in this Wheelabrator collector at the New



Jersey Zinc Co., Empire Zinc Div., Colorado. Continuous and automatic, it controls dust without downtime for shaking or dust disposal.

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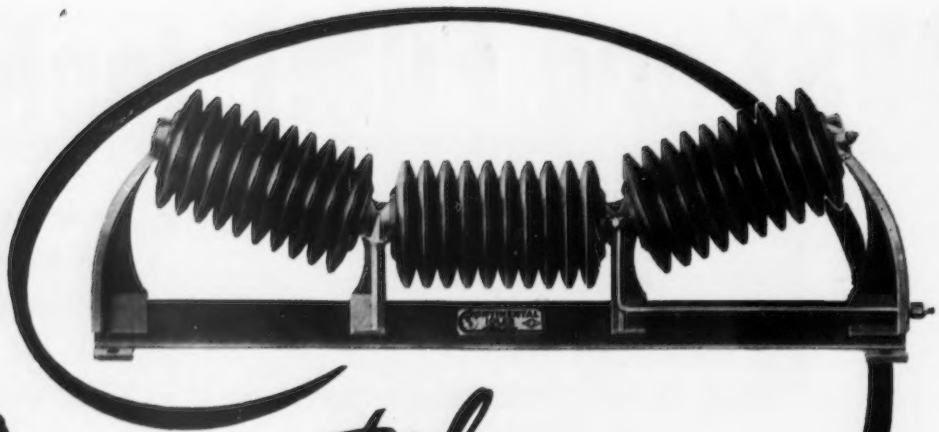
438 S. Byrkit Street, Mishawaka, Indiana



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In Conveyor Belt Life

Insist on Continental Impact Idlers under the loading point of your conveyors:

1. **Absorbs greater impact**
2. **Increases belt life**
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Here's a typical installation that is really paying off—a Continental Shuttle Conveyor handling 600 TPH at 350 FPM. Systems such as this are constantly proving the value and reliability of Continental Conveyor Equipment.

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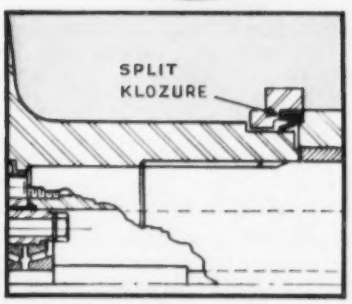
Garlock Split-KLOZURE Oil Seal—specifically designed for heavy equipment.

Goodman Mining Machines get positive bearing protection with KLOZURE* OIL SEALS!

The bearings on Goodman Mining Machines are subjected to the most severe service conditions—particularly coal dust and dampness. To provide positive protection for these costly bearings, Goodman engineers use dependable KLOZURE Oil Seals.

Garlock Split-KLOZURES, which can be installed around the shaft *without* dismantling the equipment, are used on the main bearing. Standard Model 53 Finger Spring KLOZURES (not illustrated) are used on the tractor roller bearings.

Let us show you how superior KLOZURE Oil Seals can solve your sealing problems. Just contact the Garlock office nearest you, or write for KLOZURE Catalog 10.



Cross section shows Garlock Split KLOZURE Seal as applied to the rotor assembly (main) bearing of Goodman's Type 401 Miner.

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Batteries CUT
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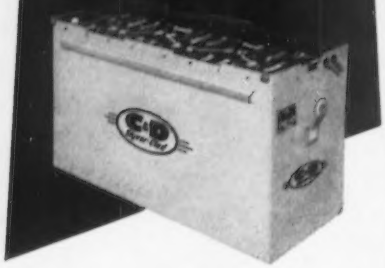

How? Exclusive C & D Five-Fold Slyver-Clad plate insulation! Virtually eliminates shedding and sedimentation! You get more power per cubic inch of battery. You get more work for less cost! Specifically—

10% MORE CAPACITY

Longer, heavier Slyver-Clad plates pack extra power.

EXTRA LIFE

Active material stays in plates—works longer!

All this in—
STANDARD SIZE TRAY

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of Conshohocken, Pa.
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in Principal Cities from Coast to Coast

The Philippines *(Continued)*

Surigao Consolidated has started working its new copper development in Zambales province, not far from the Cabancan copper property of Mindanao Mother Lode. The new mill of the latter is expected to go into operation in April or May.

Masara mine, controlled by Samar Mining Co., has tested out its 250-ton mill successfully, producing lead and copper concentrates of satisfactory grade. Plans are underway to expand the capacity to 400 tons by mid-1956.

First shipments of iron ore from the Mati mine in Davao are expected this month. Mine is owned by the Philippine Iron Mines. Initial production will be 500 tpd., direct shipping ore. Production is under contract to Japanese steel mills. Ore reserves are reported at over 1-million tons averaging 62.5% iron.

IN LATIN AMERICA

ARGENTINA

Argentina's exportable mineral surplus may now enter world markets on a fully competitive basis. A recent Central Bank Circular states that the following minerals, which formerly had to be sold at the official rate of 18 to the dollar may now be sold with rates of exchange and currency to be negotiated freely between buyer and seller:

Bismuth, copper, copper and silver, tin, tin and silver, silver, lead, tungsten and zinc ores, and other minerals; cobbles, gypsum, other stones and earths, calcium and sodium borate, asphaltite and common salt.

Report of the Argentine Special Tungsten Commission, which has been unanimously endorsed by the executive committee of the Federación Argentina de Minería, recommends:

(a) Tungsten, beryllium and mica be returned to free trading.
(b) A minimum support price be set immediately of 75 pesos a kilo for refined tungsten with a minimum fineness of 65%.
(c) The support price be reviewed semi-annually, taking into consideration costs for labor, fuel, taxes, etc.
(d) That similar steps be taken for beryllium and mica.

Unión Minera Argentina (Argentina Mining Association) in a statement early in January hailed government moves to free trading and exchange rates, which the group says, "have caused a great feeling of optimism in the industry and brought about favorable new conditions for the development of the industry."

The majority of producers, who have not, up until now, been able to make investments and procure adequate machinery will now work towards mechanization of their holdings, with a consequent rise in production and lowering of costs, U M A states.

The mining group notes a great interest on the part of foreign buyers, not only in traditional mineral exports, but in new ones.

Value of Argentine production of non-metallic minerals is more than 800-million pesos a year, according to figures newly released by the Federación Argentina de Mineria. Combustibles and sulphur are the two largest items in this category.

Metallic minerals are produced to the value of 350-million pesos per annum. Of this production 85% is used by the domestic market and 15% is exportable.

Other statistics, supplied by the Unión Minera Argentina, show that of total mine production, only 3% is accounted for by large, fully mechanized mines, where foreign capital is in the majority. Medium-sized, technically developed but sparsely mechanized mines operated entirely by Argentine capital produce 20% of mineral output, while small unmechanized "artisan mines" produce 77%.

The industry as a whole employs some 800,000 workers.

Argentine mining industry is having a hard time getting its hands on $4.5-million worth of machinery, vehicles, electronic equipment and tools bought under the previous regime by I.A.P.I. the state trading organization which is now in process of liquidation.

In spite of pressure by F.A.M., no solution has as yet been found to the price problem. The equipment was imported at the artificial price of 7.50 pesos to the dollar. The official exchange rate is now 18 to 1. Mineral exports sell on the free market where the dollar is currently worth around 40 pesos. The question is: At what rate will mine operators pay for the equipment now in the hands of the government?

Price seems to be the only hitch. I.A.P.I. acted in this case only as buying agent. The deal was financed by the Industrial Bank, which set up a system of priorities as follows: first, mining cooperatives; second, small mining enterprises under direct personal exploitation; and, third, small and medium mining enterprises.

Santa Rosa tungsten mine, newly acquired by Minera San Martin, S.A. began work early this year with new installations. Mine is one of two Argentine producers of pentoxide of vanadium and will be the only producer in all of Latin America of dioxide of beryllium.

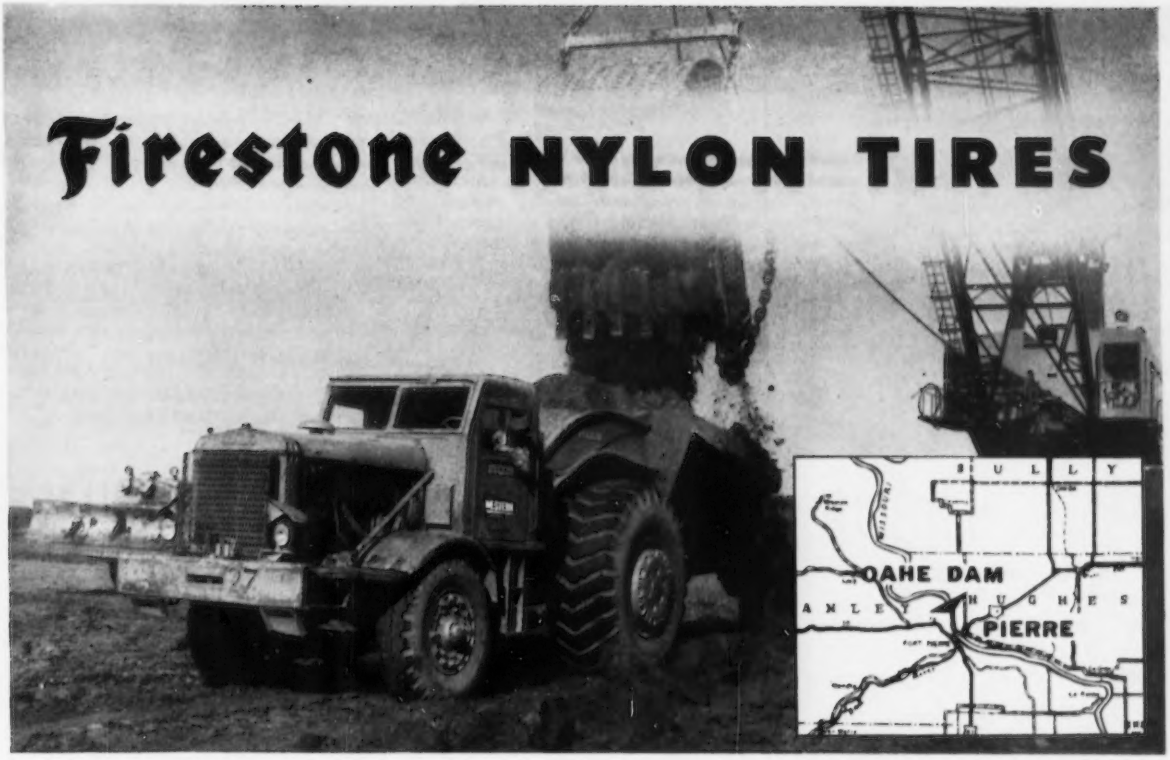
PERU

Standard Ore and Alloys Corp. reports the return of its exploration teams after several months of intensive work on its Landa properties near the Colpe River in the Cusco area.

Torrential rains making further work impossible for an estimated two months, the temporary camps were discontinued.

Preliminary reports are said to indicate

Firestone NYLON TIRES



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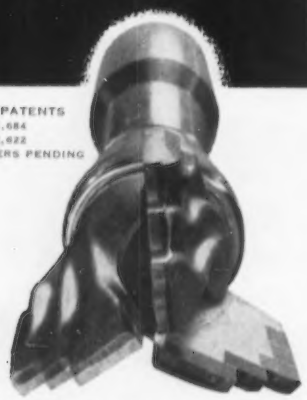

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Peru *(Continued)*

an estimated 9½-million tons copper ore averaging 3½% to 4% Cu, extending over an area of 2.2 miles and an exposed down dip for 700 meters.

Following temporary production cutbacks caused by power shortages resulting from drouth conditions in the central and western Sierras, Cerro de Pasco Corp. reported having resumed production of refined copper and lead, with full-scale production of all affected items restored Feb. 15, 1956.

The corporation announced that normal power had been restored to the copper and lead refineries at Huaymanta and the electrothermic zinc furnaces at La Oroya Jan. 26. The first production of refined lead, following the power shortage, occurred Jan. 28, with production of refined copper having been resumed Jan. 30. Restoration of normal production of bismuth, silver, electrothermic and electrolytic zinc came about Feb. 15.

CHILE

Value of Chilean exports for 1956 has been estimated at $500-million. Of this total, copper is by far the main export and has been valued at 40c per lb for the whole year.

Because gold has been falling steadily in the Stock Exchange in the last few months, many small gold mines and even mines with cyanide mills have been compelled to shut down; among others, Capote Aurífero and Restauradora Aurífera de Petorca owned by Paulino Callejas and Sons.

Punta del Cobre mill located near the Paipote copper smelter will increase capacity by 1,000 tons of ore per month; copper leaching plants will be constructed at the Punta del Cobre and Domeyko mills. Another leaching plant will also be built at the site of the Paipote smelter.

Cost of this new capacity has been estimated at 215-million Chilean pesos and the output of copper will be increased by 4,150 metric tons yearly under Mining Bank plans. In order to lower the cost of ore buying 209-million pesos will be spent in mechanizing ore buying. The combined cost of improving both mills and ore-buying agencies amounts to $1.4-million dollars.

National Smelters Corp., a government agency that runs the Paipote smelter, is going ahead with its project to build a copper smelter in Central Chile, though it has not been decided yet whether the old Chagres smelter, which is owned by a French company, will be reconstructed or an entirely new smelter built.

Corporation has agreed in principle to smelt the concentrates from the medium size producers on a toll basis rather than buy them outright, as is the case with the Paipote smelter whose main supply of ores and concentrates come from a large number of very small producers.

Last year 8,521 metric tons of high grade manganese ore were exported through the port of Coquimbo to the U. S., Germany and Belgium. Through the same port, 344,000 metric tons of high grade iron ores were also exported, mostly to the United States.

Ministry for Economics has authorized South American Consolidated Enterprise the investment of half a million dollars in the copper deposit of Mantos Blancos, east of Antofagasta. The drilling of this orebody was done by Muricio Hochschild's interests and now a company has been formed to open the mine and develop a process to leach the ore. Under the new tax law on copper, new mining enterprises are allowed a kind of accelerated write-off and, consequently, the capital brought into the country must be approved by decree and registered.

Three government agencies, Mining Credit Bank, Chilean equivalent of the RFC (Corporación de Fomento) and the National Smelters Corp. are getting together to form a corporation to exploit uranium minerals in Chile. Though the commercial existence of radioactive minerals in the country has been proved beyond doubt, the location, grade, etc. of such ores has been withheld systematically by the mine owners because the Government announced some years ago that a bill would be sent to Congress to make the exploitation of radioactive minerals a State monopoly. Miners as a whole believe that if this country does not follow the same or a similar policy as that of the United States, Canada, Australia and South Africa, it is unlikely that uranium mining will ever amount to anything in Chile.

BRAZIL

Export-Import Bank will lend $3.9-million to Cia. Vale do Rio Doce to cover purchase of mining equipment and expansion expenses, as well as development of transportation facilities to move iron ore from the government-owned property.

COLOMBIA

Gold and silver output for 1955 slightly increased over the previous year. Figures are in ounces.

	1954	1955
Gold	377,467.15	380,824.03
Silver	112,534.24	112,035.11

MEXICO

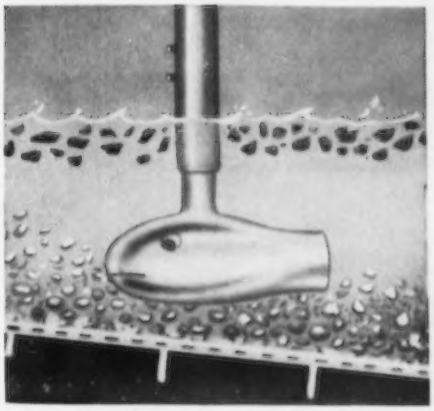
An operation said to be unique in the mining industry was formally inaugurated Feb. 10 in the western state of Jalisco.

The mine, Cia. Minera Autlán, about 200 miles southwest of Guadalajara, reportedly is the only manganese mine in the world which uses the long-wall retreat method, common in coal mining.

Under operations at Autlán, a main

Jigging stratifies materials according to specific gravity, separating solids in upward and downward pulsations of water. The heavier materials settle to the screen plate and are drawn off. The lighter materials overflow.

Jigging is an almost universal separating process for materials ranging from the specific gravity of gold at 19 to coal at 1.3. Proportions of the high-gravity materials may vary from 90% to 10% or less.



jig recoveries compare favorably with float-and-sink (heavy liquid) recoveries on Mesabi iron ores

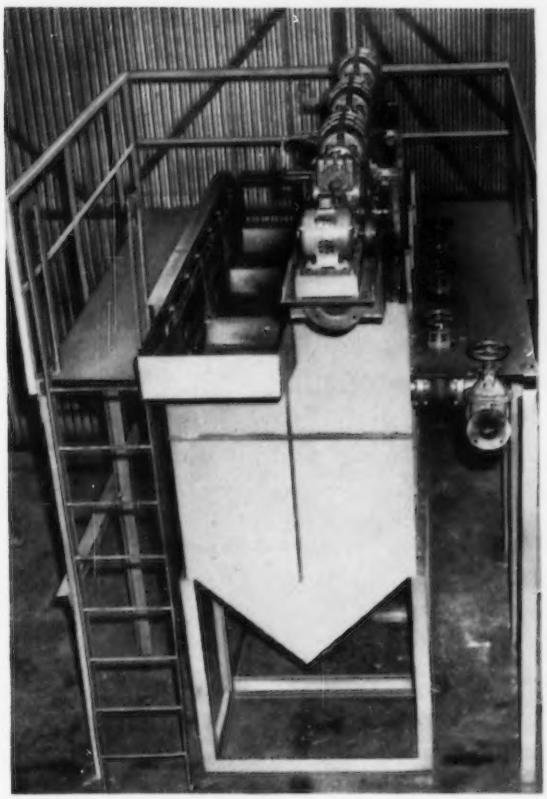


Illustration shows Jeffrey all-hutching jig in which high-gravity materials are withdrawn through perforations in the screen plate. Other models are also available.

	Ore	FLOAT-AND-SINK		JIG	
		Fe, %	Recovery, %*	Fe, %	Recovery, %
All Sizes 1″ x 0″	"A"	58.8	96.4	56.79	88.5
	"B"	59.9	95.3	59.53	82.7
	"C"	57.9	92.3	57.80	82.6
	Av.	58.9	94.7	58.04	84.6
+65 Mesh for F-&-S and +48 Mesh for Jig	"A"	58.8	94.8	57.83	90.7
	"B"	59.9	89.8	60.71	93.8
	"C"	57.9	89.7	58.83	88.4
	Av.	58.9	91.4	59.12	91.0

*All minus 65-mesh iron considered recoverable.

In the above tabulation, recoveries by jigging to 48 mesh are compared with possible recovery shown by float-and-sink to 65 mesh. The average figures show that the jig recovery in the + 48-mesh sizes is the same as that shown by float-and-sink down to 65 mesh.

Complete technical data on these tests will be furnished upon request. Write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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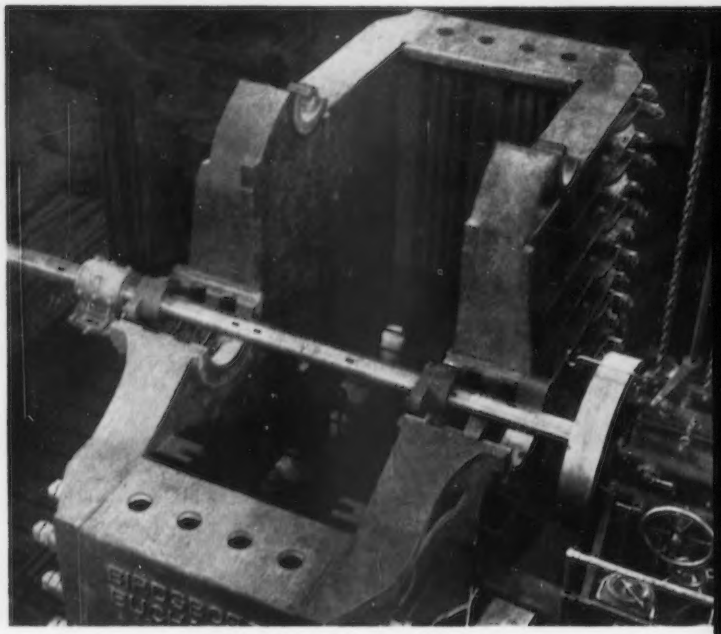

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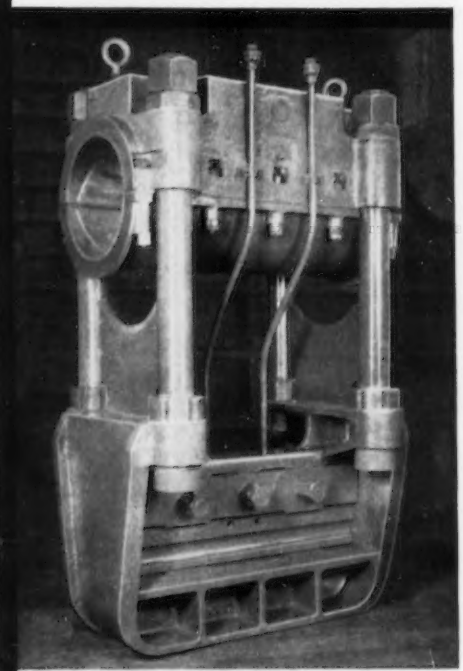

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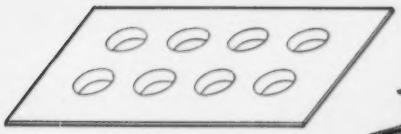
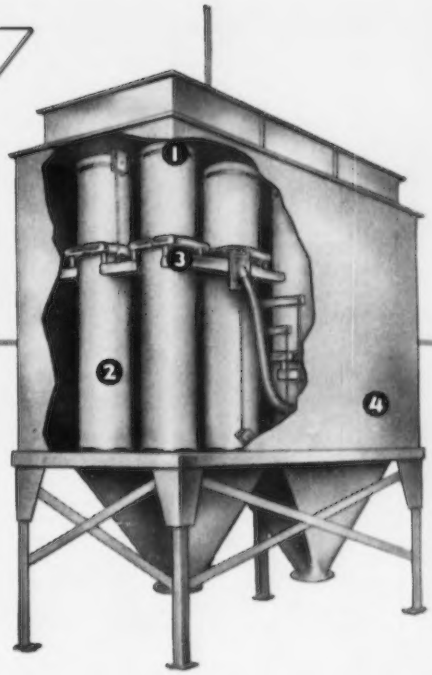
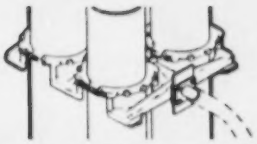
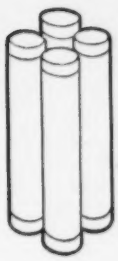


1 Air enters plenum casing at top of Series 12 Aeroturn for equal distribution to all filter bags. Bags are of felt . . . with higher filtering efficiency than woven material. Tiny pores hold even submicronsized dust particles. Cloth area is less than ¼ that of shaker bags.

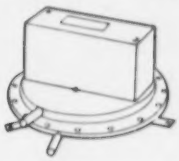




3 Self-adjusting blow rings* travel length of filter bag exterior . . . discharge reverse-air-jet into bag which blows accumulated dust off bag walls. Cleaning never interferes with filtering . . . which maintains peak efficiency. Aeroturn remains on the job continuously.

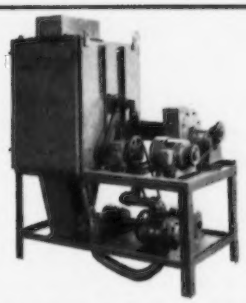


2 The air travels downward through the filter bags, assists delivery of dust into hoppers below . . . escapes through bag walls. Even distribution of dust puts every square inch of the filtering surface to work . . . avoids clogging . . . permits air to escape easily.



4 Automatic pressure switch* controls blow ring operation. Above normal pressure loss automatically actuates blow rings. When pressure loss normalizes, blow rings stop operation. Self-cleaning occurs as often or as little as needed . . . avoids over-cleaning.

Up to 75% Lower Installation Costs—99.9%+ Efficiency with KOPPERS Series 12 Aeroturn Dust Collectors!



Factory-assembled and test-operated, Koppers Model D Aeroturn Dust Collector combines features of Series 12 with unusual compactness. Capacities range from 500 to 4,800 CFM.

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Operation is continuous and automatic . . . without a drop in peak efficiency due to cleaning. Pre-fabricated Koppers Series 12 Aeroturn ranges in capacity from 1,000 to 60,000 CFM . . . contains from 4 to 64 filter bags each 12″ in diameter and up to 18′ in length.

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Mexico *(Continued)*

tunnel is driven into the mountain. From the tunnel, crosscuts are made along the manto, or horizontal vein. Then the entire face of the long wall is blasted. After blasting, scrapers load directly into mine cars or into chutes which discharge into mine cars.

Moving deeper into the mountain, another 25,000 tons or 50,000 tons is blocked out for another crosscut and a repetition of the long-wall blasting. Until blasting, the crosscut is bolstered by special jacks.

Main advantages of this type of mining include the fact that no pillars containing valuable ore are left and that no equipment is tied up in areas already mined.

In Autlán, mine cars dump into a bin which empties onto belt conveyor number one. Ore then is moved to a shaking screen. Oversize goes into a crusher then falls onto belt conveyor number two, which already caught the undersize. Belt No. 2 discharges onto a second shaking screen. Undersize falls into jigs. Oversize tumbles into a revolving heavy media drum. This drum, at each end, discharges onto two belts, one conveying waste to its pile and the other belts moving high-grade to storage bins. Trucks pass beneath these storage bins then haul the concentrate 100 miles southwest to the port of Manzanillo, state of Colima. Ships take the concentrate to U. S. steel firms, principally Bethlehem Steel Corp., which, with Mexican interests, developed the Autlán property.

Capacity of the heavy media mill is 1,000 tpd but initial operations are at the rate of 500 tpd. Ore reserves of 45% to 48% manganese with less than 15% silica were described as adequate. The ground is heavily faulted.

Ing. Enrique Madero, Jr., is general manager of the operation, which includes 500 employees. Ing. Jose Zozaya is mine superintendent; Ing. Calvillo is mill superintendent; geologist is Ing. Llamas.

Among those who attended the elaborate inauguration ceremonies were Enrique Madero, Sr., former Mexican President Lázaro Cárdenas, Ing. Gustave P. Serrano, chairman of the Mexican Mining Chamber, and Ing. Salvador Pena, of the mining tax division of the Treasury Department.

La Compania Minera Arena, S. A., plans to begin in March or early April the operation of a 200-tpd flotation mill to treat galena and sphalerite ores at its mine, 80 miles southeast of Mazatlán, Sinaloa.

The mine, known as the Old Copala, was worked by the Spanish conquistadores for its silver. Intent on silver, the Spanish scratched only the surface of reportedly lead and zinc veins which were not valued then as now.

Actual workings of the mine take the form of an adit with crosscuts and drifts along the veins. Terrain is rough—the foothills of the Sierra Madre Occidental. Mill and compressors are to be operated by diesel power. Proven reserves reportedly will last two years at 200 tpd. Further exploration is underway.

Ing. Jose Aguilar, general manager, is known as one of the finest operators in Mexico of small mines.

Recent expansion of steel mills at Monterrey of Cia. Fundidora de Acero y Fierro, S. A., has stimulated the need for more output from the more than 100 mines it owns or controls, through a subsidiary, Cia. Minera del Norte.

One such mine is La Luz, a manganese operation 11 miles southeast of Dinamita, Durango. While production has not been greatly stepped up at La Luz, the mine's value to the steel expansion has grown in importance.

Into the mountain called El Sarnoso an adit has been taken 600 ft at the 900-ft level. Currently some 40 men are producing 1,000 tpm under the direction of Ing. Alfredo Backhoff, mine manager.

Blasted ore is hand-loaded into cars which are then shoved to a clearing just outside the adit entrance. Here the high-grade is hand-picked and loaded into two bins. These bins unload into 14 cable cars on an aerial tramway which is slightly more than a mile from summit to base. At the base, these cable cars dump into one of four raised bins. These bins discharge directly into trucks.

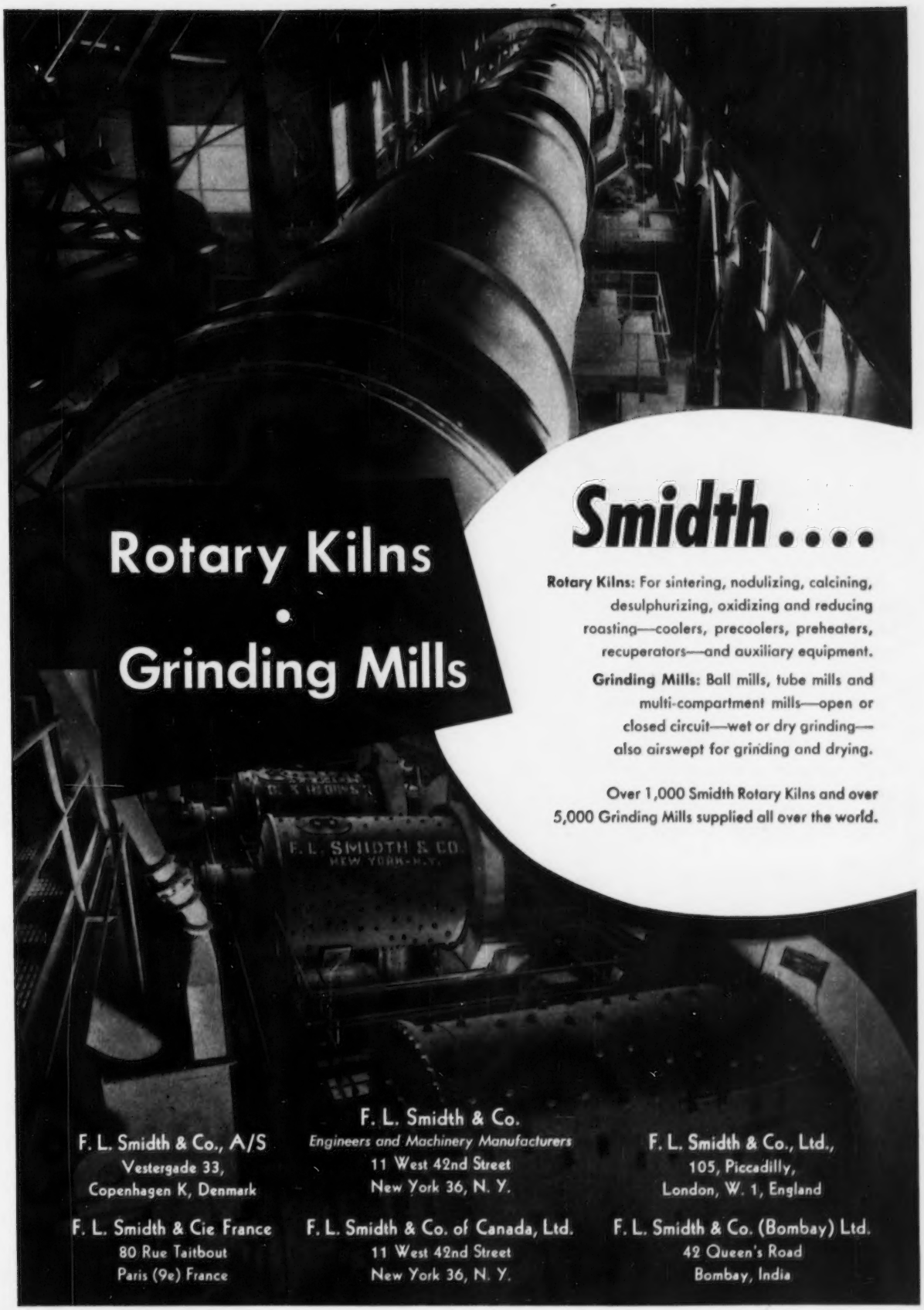
Ore takes the form of two manganese oxides, pyrolusite and wad. Reserves have been estimated at only 20,000 tons but a program of exploration is underway.

IN AFRICA

Usefulness of geiger counters for mine sampling is being determined by research work conducted by South African gold miners, based on the fact that reef formations contain some quantity of radioactive material, chiefly uraninite, with a relationship to gold content. Counters are being tried out on reef and waste belts to check accuracy of sorting. Another aspect being discussed is placing counters at points of high gold content to check on theft or removals. Further possibility is the use of gold isotopes as route samples between mine and reduction plant to identify causes and geographical position of losses during mining and recovery operations.

Gold production of South African mines during 1955 was 14,602,267 oz valued at over $511-million. Up to the end of October exports of radioactive material, virtually all of which are a by-product of gold mining operations, realized $67¾-million. Uranium profit of gold mines for the year was $49,162,000. Estimates for the current year are gold, $546-million and uranium (gross value), $112-million.

Drilling operations by Katuma Mining, a subsidiary of the Patino group, will be undertaken to investigate a possible lead occurrence in Tanganyika, 35 miles south of Mpanad Lead Mine. A lead ore occurrence in the Ulugura mountains and indications of a monazite deposit were discovered by a member of the Geologi-



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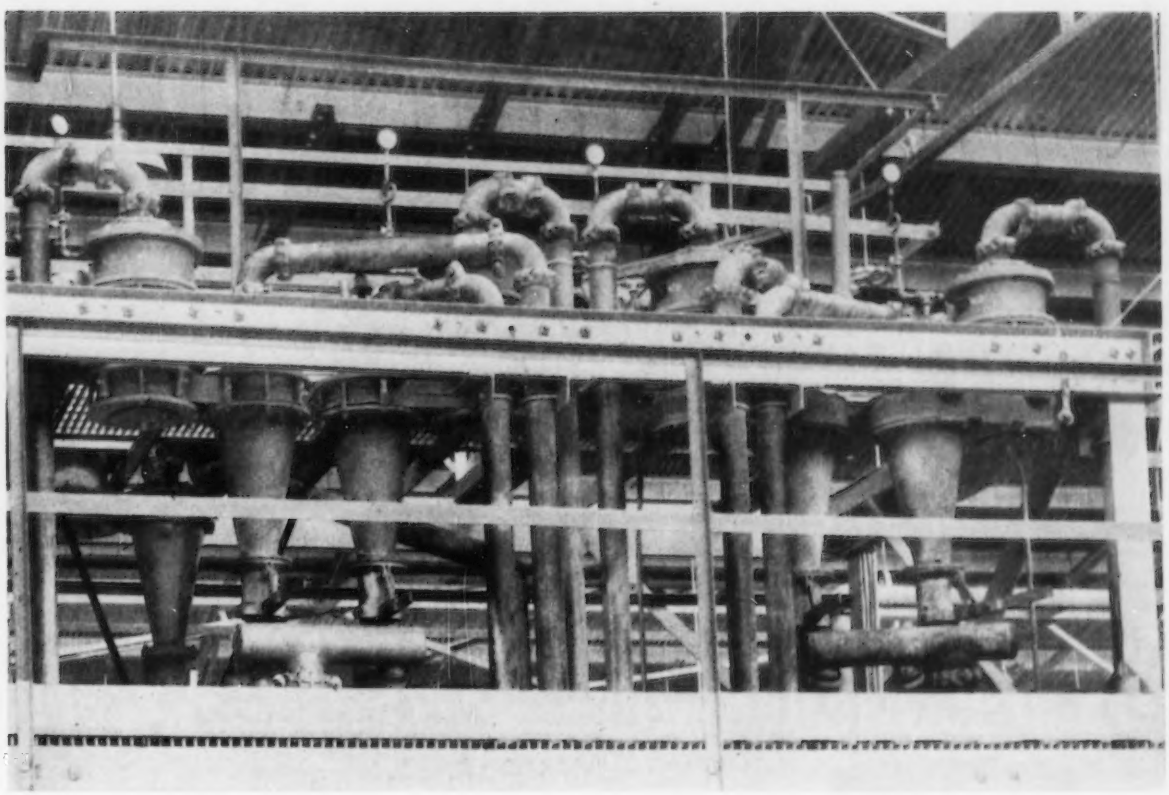
This is one of more than 40 Marion machines at work for one owner in one of the biggest producing copper mines of the world. It is a 7 yard Marion 151-M, designed for continuous service in the world's heaviest digging.

MARION POWER SHOVEL CO. • MARION, OHIO

Simultaneous 98% rejection and recovery at 200 mesh by new cyclone design



Krebs Integral Two Stage Cyclones

Krebs Integral Two Stage Cyclones attain this remarkable performance by recycling critical sizes from the secondary overflow back to the feed. It is in effect two stages of cyclones, but synchronized and fed by one pump. Rejection of —200 is the prime objective but the primary cylinder's efficiency holds the losses of +200 below 2%. If the objective were to produce a —325 mesh overflow these versatile two stage units can be fitted and adjusted to do so. The accomplishment of this plant was predetermined by full scale investigation in the pilot plant of Equipment Engineers. After a year's operation the molded replaceable pure gum rubber linings, precision fitted to steel shells, show negligible wear.

	Feed	*Overflow*	*Underflow*
TPH	75.0	31.0	44.0
% Solids	26.0	13.7	70.0
GPM	968	825	143
% + 35	0.4		0.7
+ 48	2.3		3.9
+ 65	17.1		29.2
+ 100	28.9		49.2
+ 200	10.0	2.3	15.5
— 200	41.3	97.7	1.5
	100.0	100.0	100.0

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HAMMOND'S SAFE BLASTING EQUIPMENT

EXPLOSIVE BOXES

These rigid non-conductive explosive boxes represent a prime safety investment. Made entirely of wood-tongue-grooved and dove-tailed construction . . . no metal parts . . . automatic lock . . . rubber band spring . . . moisture-resistant. Box sizes are based on 1¼ x 8" sticks.

WOOD TAMPING POLES

For Tamping Explosive Shots: Poles are round, made of Hardwood. Sizes to 10' long.

SECTIONAL TAMPING POLES

These poles are made of straight grained wood and are coupled together with removable wood pins held in place in recessed grooves by a rubber band and can be quickly connected and unconnected. Couplers and Head Blocks are 4, 5, and 6 inches in diameter. Please specify size when ordering. Poles are 1½" in diameter.

J. V. HAMMOND CO.

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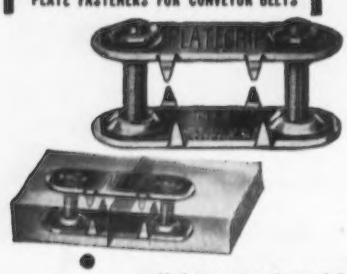
PLATE FASTENERS FOR CONVEYOR BELTS



Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from 1/4" to 1½" thickness. Write for Catalog Sheet.

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Africa *(Continued)*

cal Department of the Tanganyika Government. Preliminary investigations are "distinctly interesting" but work has been suspended during the rainy season and will not be resumed for some months.

Diamond sales during 1955 were over $208-million, nearly $40-million above the previous record figure of 1952. Gem stones realized $140.7-million and industrials, $67.3-million.

Rhodesia Broken Hill Mine's 1955 zinc production was 27,900 long tons compared with previous best of 26,550 tons and lead output was 16,050 long tons, 410 tons better than the 1947 record.

Opening of the Van den Heevers Rust area in the Orange Free State has been agreed upon by Anglo-Transvaal Consolidated and General Mining and Finance. Area is underlain by a shallow gold-bearing formation along five miles of strike but of no great breadth or dip. The reef is thick and formation is duplicated several times. Underground prospecting may be initiated via a drive of the neighboring property, Loraine G.M. In view of reef formation, mining will probably be done from shafts outside the mineralized area so tonnages will not lock up in shaft pillars.

Opening up of the first mine in a large potential new gold mining area lying east of the Witwatersrand has just taken place. The company, Winkelhaak G.M., is controlled by the Union Corp., but shares have been taken by American Metal Co. and Newmont Mining. M. D. Banghart has been appointed to the board of the new company. On Kimberley reef, the main horizon sub-outcrops at about 800 ft. It is estimated that the mine will mill a grade of about 7.5 dwt. Production is expected to start in 2½ years.

Investigations into iron ore deposits on Vukewe Mountains, close to the new Southern Rhodesia-Portuguese East Africa rail link, have shown a much higher grade than was at first anticipated. New ore reserve estimates are 120-million against 60-million tons. Messina (Tvl) Development, operator of the large copper mine at Messina Northern Tansvaal, holds an option over them. This company is also negotiating to take over the State-owned Rhodesian Iron and Steel Corp.

A smelting record has been achieved at Roan Antelope in Northern Rhodesia. The new No. 3 reverbatory furnace had to function on its own for a month due to plant troubles. With a firing rate of 142 tpd coal, the following throughput was recorded: total charge tonnage, 31,871 wet tons; 28,684 dry tons. Daily average charge 1,062 wet tons; 956 dry tons. Thirty days production was 8,765 short tons blister copper, with a daily average of 292 tons.

The oldest living prehistoric men, Bushmen of the Kalahari Desert, are now filling important jobs in the gold mining industry. They are reef-picking on conveyor belts in mines during mechanical sorting. They have the most highly-developed perceptive faculty in the world as a result of their environment where life depends on tracking game over sand, and finding water. Sorting reef from waste is child's play to them. Geiger counters at the end of belts show that virtually not a scrap of ore is wasted.

Rustenburg Platinum Mines, world's largest platinum producer, is to increase capacity of its Rustenburg Mine by 5%, and its Union mine by 25%, at a cost of $7-million. Beside platinum group metals, the company recovers copper and nickel from the platinum matte which is of great economic importance. Mining will be increased.

French Colonial Production 1955

(Tons)

ALGERIA	
iron ore	2,773,100
pyrite	20,600
phosphate	547,600
barite	5,500
lead conc.	10,400
zinc conc.	41,400
superphosphate	97,200
TUNISIA	
phosphate	1,998,800
iron ore	853,500
lead conc.	31,500
zinc conc.	7,400
lead	19,000
MOROCCO	
phosphate	3,940,000
manganese conc.	245,100
lead conc.	82,000
zinc conc.	50,200
iron	183,500
cobalt	4,906
lead	22,472
FRENCH WEST AFRICA	
gold (kilograms)	3.7
diamond (karats)	144,725
ilmenite conc.	12,325
aluminum phosphate	30,250
tricalcium phosphate	32,860
bauxite	407,883
iron ore	478,651
CAMEROUN	
gold (kilograms)	7.5
tin conc.	54.5
FRENCH EAST AFRICA	
gold (kilograms)	18
mica	95.3
graphite	6,535
beryl	98
quartz, electric	2.4
quartz, ornamental	2.1
NEW CALEDONIA	
nickel conc.	496,000
chrome conc.	25,700
nickel matte	4,900
nickel alloy	2,500
ferronickel	6,000
OCEANIA	
phosphate	176,000

First nine months, from Ministre de La France D'Outre-Mer.

IN EUROPE

YUGOSLAVIA

Yugoslav copper industry reports the Sevojno copper mill in Serbiy has started production. 9,000 metric tons of rolled

Prospecting. The Universal 'Jeep'* with the extra traction of its 4-wheel drive, takes men and equipment anywhere on the lease for prospecting, exploring or survey work. It climbs grades as steep as 60%, goes where other vehicles can't go.

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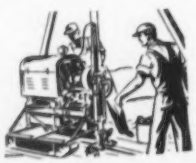

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the Plateau

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The excellent plateau on the counts per second vs. phototube voltage curve is made possible by:

- *The high efficiency of the Sodium Iodide crystal for gamma radiation.*
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- *Careful selection of phototubes.*

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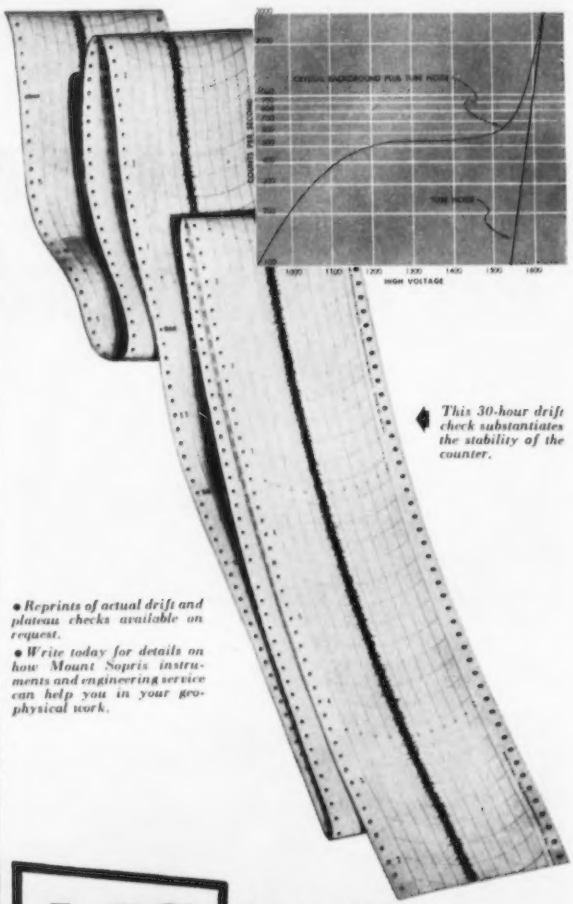
For results independent of changes in auto or aircraft input voltage, ambient temperatures, and aging of components, look for the plateau before you buy.



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Yugoslavia *(Continued)*

products have been turned out since the beginning of test operations, of which 10% were exported to the U.S. and to Brazil and Switzerland. Annual capacity is to amount to 21,000 tons of rolled copper, of which 10,000 metric tons are earmarked for export.

POLAND

New iron ore mine went into operation during December 1955, according to the Polish "Information Service". Mine, located near Malice, has been outfitted with machinery that stems in part from the USSR. Total raw iron output during 1955 amounted to 3,100,000 metric tons (the plan called for 3,500,000 metric tons), while 4,450,000 metric tons of steel were produced. (Here, the government's production plan called for 4,600,000 metric tons).

HUNGARY

A 10% increase in the quantity of iron ore deliveries from domestic sources is expected for the current year. While 70% of all needed iron ore was so far shipped in by the Soviet Union (and only 30% originated in Hungary), the future level prescribes at least 40% of domestically mined iron ore in order to reduce foreign currency-costing imports. The agglomeration center of Rudobánya, reportedly near completion, is to play a key role in the fulfillment of this government order. (In the field of coke production, Hungary covers her needs by 7% from domestic and by 93% from imported material. The 1956 level will see 20% of requirements delivered by the Hungarian enterprises, thus reducing the imports from 93% to 80%).

BULGARIA

Soviet maneuver of pulling out of Soviet satellite joint economic enterprises is described by Vienna sources as a farce. The Dec. 16, 1955 move (pulling out of Sov-Rum-Petrol in Rumania and out of the Sov-Bulg GORUBSO), certainly did not include pulling out from the Soviet-Bulgarian uranium business, observers say.

Gorubso did mining and processing of Bulgarian copper, iron, lead, zinc, chromium and manganese ores; it was the monopoly enterprise in this field.

NORWAY

Considerable expansion of the North Norway iron ore industry is now being planned, according to reports.

Plans include formation of a new share company to work the big state-owned ore deposits in the Dunderland valley, around Mo I Rana. Two private companies, Fossdal Gruver, and A/S Sydvaranger (the latter mines iron ore in Kirkenes in the extreme north), together with two state-controlled companies, Norsk Jernverk A/S, and Norsk Bergverk A/S, have indicated that they are willing to subscribe 2-million kroner each to the share capital of the new company.

Iron content of the ore in the Dunderland valley is reported to be between 33 and 35%, and there is a considerable quantity of potential hydro-electric power available from the waterfalls in the neighbouring mountains.

AUSTRIA

The average increase of 7% in the 1955 mining output (as compared to 1954) has brought production close to capacity. Federal Ministry of Trade's Supreme Mining Authority (Oberste Bergbehörde) in its annual report released the following figures: (in metric tons)

Material	1955	1954
Iron ore	2,838,450	2,720,759
Lead, zinc, molybdenum ore	176,519	164,721
Copper ore	158,639	174,757
Sulphuric ore	—	—
Antimony ore	10,978	10,065
Bauxite	19,138	17,266
Gypsum	329,656	330,328
Anhydrite	82,361	36,318
Graphite	17,814	17,403
Magnesite	991,709	839,153

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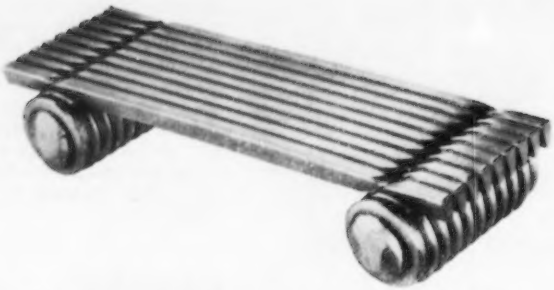

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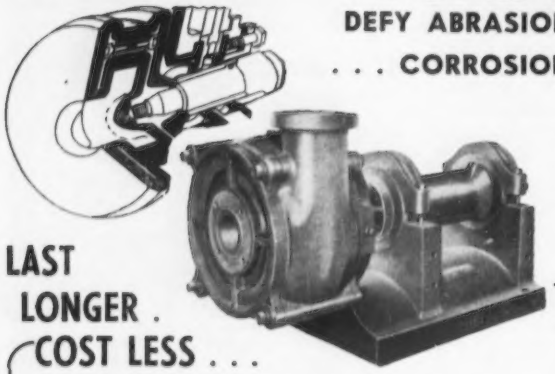

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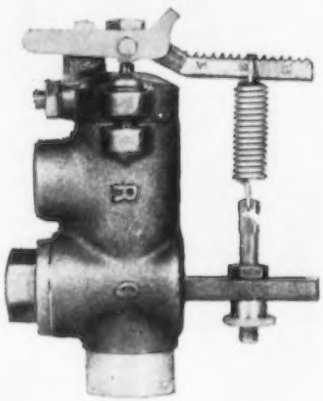

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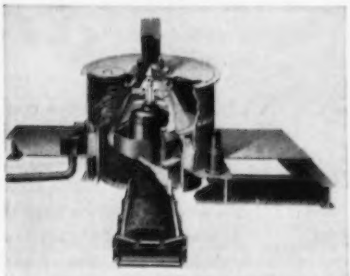

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Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts, Special Equipment for Underground or Subaqueous Construction.
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Mining Engineers & Contractors
Shaft & Slope Sinking
Mine Development
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Phone 56-5566

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Plant Design, Mechanization and Improvement
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120 Broadway, New York 5

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P.O.Box 1512
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Samplers - Analysts at Mexican Border Points
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Registered Professional Engineers
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Birmingham, Alabama
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Consulting Mining Engineer
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New York 5, N. Y., U.S.A.
Telephone BArclay 7-9484

H. L. TALBOT
Consulting Metallurgical Engineer
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REctor 2-5307

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Metallurgical Chemists — Assayers
Spectroscopists
Representatives of Shippers of Ores and metals at Buyers Works
Mine Examination Analyses
359 Alfred Ave., Teaneck, N. J.

ROGER V. PIERCE
Consulting Mining Engineer
808 Newhouse Building,
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Telephone — Empire 3-3973

WORLD MINING CONSULTANTS, INC.
Consulting Mining Engineers and Geologists
220 Broadway, New York 38, N. Y.
WOrth 2-2934

Because the consultant gives an "outside viewpoint" and is free of the traditions and inhibitions which ofttimes hamper the thinking of the men on the job, he is frequently able to see more clearly and offer valuable advice.
Let him join your staff and demonstrate the practical dollars-and-cents value of an outside viewpoint.

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
Labor Bureaus

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $16.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to ENGINEERING & MINING JOURNAL, 330 W. 42nd St., N. Y. 36, N. Y. for April issue closing March 19th

RHOANGLO MINE SERVICES LIMITED

requires

Senior Research Metallurgists

for employment in Northern Rhodesia on research and development work in the field of non-ferrous extractive metallurgy, with particular reference to copper, cobalt, lead and zinc.

Applicants must be technically qualified with minimum 5 but preferably 10 years practical experience. Starting salary in the range £1,306- £1,500 basic dependent on qualifications and experience. Free passages including family for successful applicant.

In addition to the basic salary quoted above, the position carries a variable cost of living allowance (at present £5. 4. 0. per month) and variable copper bonus (at present approximately 100% of basic salary), as well as generous pension, life assurance and medical schemes. Housing provided at nominal rental. Leave 51 days per annum, accumulative up to 3 years.

All figures quoted are in sterling.

Replies, stating age, marital status, qualifications, experience record and availability, together with names of two references, and a recent photograph, should be addressed by air mail to:—

The Secretaries,

Rhoanglo Mine Services Limited

P.O. Box 172, Kitwe, Northern Rhodesia

CHIEF GEOLOGIST

Exceptional opening in aggressive expanding mining operation for top flight geologist capable handling technical and executive duties. Position includes planning exploration, handling personnel, and coordinating operations closely with those of Mining Division. Both domestic and foreign explorations require highly adaptable individual, not averse to travel. For immediate confidential consideration, please give complete information on age, education, experience and salary required.

P9176 Engineering & Mining Journal

330 W. 42 St., New York 36, N.Y.

EQUIPMENT MANAGER

Required by transportation company headquarters in Whitehorse, Yukon Territory. Applicants must be graduate engineers mechanical, mining, metallurgical or civil between the ages of 40-45 years with at least ten years experience in the selection, operation, and repair of automotive, crawler and contractor's work equipment or mechanical equipment used in open pit mining operations and motor truck transport. Business administration experience desirable, but not essential. Married man preferred; housing available. State salary required and forward references on application along with recent photo and record of salary progression to date. Interviews will be arranged at suitable point if applicants justify.

P-8425—Engineering and Mining Journal
68 Post St., San Francisco 4, Calif.

PROJECT ENGINEER WANTED

Graduate Mining, Metallurgical, Chemical or Mechanical Engineer, preferably 25 to 35 years old, wanted by medium size progressive heavy machinery manufacturing company located in Southeastern Pennsylvania. To assist in design and preparing for market of various lines of equipment used in mineral dressing, heavy chemical, cement and rock products industries. Must have had engineering and field experience, and be willing to work on drafting board, travel and do field service. Opportunity also exists for a properly qualified individual, eventually to become a sales engineer. Salary open.

P-7533 Engineering & Mining Journal
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

U. S. Company operating in Central America has opening for Engineer capable routine mine surveying and assist Chief Engineer in checking native transitmen and samplers. Two year contract. B.S. beginner or experience equivalent. Knowledge Spanish helpful but not essential. Married man preferred. Well established camp with adequate facilities for dependents. P-9145, Engineering & Mining Journal.

Applications are invited for the position of Research Metallurgist at a large base metal mine in South West Africa. Applicant should have considerable experience in base metal flotation on research or flotation operation. Company offers three-year contract, transportation for self and family, and salary while traveling. House furnished with heavy furniture available for married man. Climate and living conditions excellent. Forward reply, giving age, education, experience record, references and marital status to: P-9146, Engineering & Mining Journal.

Junior Metallurgist, to perform control work and ore dressing research in a 5,000 ton magnetic-gravity-flotation mill. Excellent opportunity for recent graduate. Liberal housing policy and benefits. Location Northeast. Salary open. P-9008, Engineering & Mining Journal.

Ore dressing engineer and technicians to handle test work in commercial laboratory. Engineer to assist in plant design, cost estimation, and engineering controls. Age 25 to 35. Preferably B.S. mining degree. Excellent opportunity to grow with progressive organization. Salary commensurate with experience. Headquarters Florida. P-8873, Engineering & Mining Journal.

U. S. Mining Company operating in South America has opening for Assistant Mine Manager. Considerable underground experience and knowledge of Spanish essential. Fine potential for career-minded man with administrative abilities who has development possibilities for full management responsibilities. Immediate employment for customary three year contract period. Camp well established with adequate facilities for dependents. P-9010, Engineering & Mining Journal.

Research Metallurgist required for Island of Cyprus. Metallurgical engineer or mining engineer with good training and experience in metallurgy to conduct tests for improving practice in 100 ton per hour mill floating heavy copper sulphide ores and also to conduct tests on grades and mixtures of varying copper content. Aptitude and interest primarily research. Age 30-45 years. Three year contract. Salary open. Submit complete record and list of references with first reply. Cyprus Mines Corporation, 523 West Sixth Street, Los Angeles 14, California.

MOTOR DESIGNER—E. E.

Design D. C. Motors—5 H. P. to 100 H. P. Ten years' practical experience in motor design work.

Permanent positions open with 75 years old manufacturer of heavy machinery. Reply in first letter giving detailed experience and present salary range.

P9270 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

TECHNICAL MINING PERSONNEL

Nation wide recruitment through 54 offices of the National Ass'n of Personnel Consultants at no charge to the employer. The Pacific Northwest's leading employment firm.

ACME PERSONNEL SERVICE

P.O. Box 132, Dishman Branch, Spokane, Wash.

POSITIONS VACANT

Assistant Superintendent for 1000 t.p.d. silver-lead-zinc mine and flotation mill Northern Mexico. Experience in Mexico or Latin America is essential. Technical education necessary. Give references experience record and salary desired with first letter. P-9287, Engineering & Mining Journal.

Wanted—Experienced diamond drill designer. Apply Chicago Pneumatic Tool Co., Utica, N. Y.

General Superintendent wanted for underground metal mine and plant operation, South. Mine producing 1,100 tons per day. Must be mining engineering graduate, about 45 years of age, fully qualified with broad practical and supervisory experience particularly in underground metal mining along with general plant operation and labor relations. Please submit chronological record experience with details of education and personal information. Salary open. P-9324, Engineering & Mining Journal.

Opportunity for Young Engineer: Old established mining company in Northern California needs young mining, civil or mechanical engineer for open pit and underground operation. Good schools including high school and junior college nearby. Excellent climate, 2600' elevation. Write giving details of experience, age, salary expected and recent photograph. P-9325, Engineering & Mining Journal, 68 Post Street, San Francisco, California.

(Continued on opposite page)

When Answering

BOX NUMBERS . . .

to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

POSITIONS VACANT

(Continued from opposite page)

Mining Engineer, B. S. in mining or mining geology. Progressive open pit, copper operation in Southwest. Reply giving complete resume P-9452, Engineering & Mining Journal.

Expanding major oil company operating in all sections of Middle West and Rocky Mountain areas interested in employing recently graduated mining and geological engineers for training in oil production. Good starting salary and opportunity. Please submit complete resume of education and experience. All replies treated confidentially. P-9353, Engineering & Mining Journal.

POSITIONS WANTED

Mining Engineer, graduate, age 48, 5 yrs. mining, employed last 10 years large mapping organization, wants permanent position general engineering or surveying surface mining this country. PW-8985, Engineering & Mining Journal.

Chief Engineer, 6 years with major aluminum producer's bauxite quarry operations in South America, managerial and consulting experience, mining graduate '37, multilingual. Previously engaged gold dredging, non-ferrous metallurgy, rock-wool manufacture. Available for foreign or Stateside assignment May '56. PW-8833, Engineering & Mining Journal.

Mining Engineer-Manager—30 years experience. Engineering, production, construction, management. Coal, iron, metals. U. S., Foreign. PW-9261, Engineering & Mining Journal.

Mining Engineer. Broad experience in uranium exploration and development. 20 years mineral exploration, development and operation. Employed. PW-9262, Engineering & Mining Journal.

Canadian Graduate mining engineer employed as chief engineer Canadian gold mine desires change to gain experience. Six years in gold and lead-zinc mines. Age 39. Small family. Willing to go abroad. PW-9235, Engineering & Mining Journal.

Mining Engineer, eight years as manager and consultant producing mines. Broad experience in operation and development, design and construction of mining and treatment plants, labor negotiation. Married, children. PW-9510, Engineering & Mining Journal.

Young Mining Engineer experienced ore trading also economic assessments developing mines desires association aggressive organization. PW-9359, Engineering & Mining Journal.

MINING ENGINEER

Excellent opportunity for engineer thoroughly experienced in open-pit mining methods and equipment. Prefer also some experience in underground operations. Position involves assisting mining executive in administrative responsibilities and requires man, age 33-40, capable advancing into executive capacity. We are interested in a man now employed in managerial or otherwise highly responsible mining work who aggressively desires and is capable of advancement not available in his present employment. In confidential reply, give age, education, experience, and salary required.

P9127 Engineering & Mining Journal
330 W. 42 St., New York 36, N.Y.

RHOANGLO MINE SERVICES LIMITED

requires

Research Chemists

for employment in Northern Rhodesia on research and development work in the field of non-ferrous extractive metallurgy, with particular reference to copper, cobalt, lead and zinc.

Applicants must be technically qualified in chemistry or chemical engineering with minimum 2 years practical experience. Starting salary dependent on qualifications and experience with minimum of £892 per annum. Leave 41 days per annum, accumulative up to 3 years.

In addition to the basic salary quoted above, the position carries a variable cost of living allowance (at present £5. 4. 0. per month) and variable copper bonus (at present approximately 100% of basic salary), as well as generous pension, life assurance and medical schemes. Housing provided at nominal rental.

All figures quoted are in sterling.

Replies, stating age, marital status, qualifications, experience record and availability, together with names of two references, and a recent photograph, should be addressed by air mail to: —

The Secretaries,
Rhoanglo Mine Services Limited
P.O. Box 172, Kitwe, Northern Rhodesia

RHOANGLO MINE SERVICES LIMITED

requires

Research Metallurgists

for employment in Northern Rhodesia on research and development work in the field of non-ferrous extractive metallurgy, with particular reference to copper, cobalt, lead and zinc.

Applicants must be technically qualified with minimum 2 years practical experience. Starting salary dependent on qualifications and experience with minimum of £892 per annum. Leave 41 days per annum, accumulative up to 3 years.

In addition to the basic salary quoted above, the position carries a variable cost of living allowance (at present £5. 4. 0. per month) and variable copper bonus (at present approximately 100% of basic salary), as well as generous pension, life assurance and medical schemes. Housing provided at nominal rental.

All figures quoted are in sterling.

Replies, stating age, marital status, qualifications, experience record and availability, together with names of two references, and a recent photograph, should be addressed by air mail to: —

The Secretaries,
Rhoanglo Mine Services Limited
P.O. Box 172, Kitwe, Northern Rhodesia

SALES ENGINEERS

Explosives manufacturer with nation-wide distribution has attractive openings for men with technical background or practical experience as sales engineers; age under 30 preferred. Starting salary commensurate with experience. Considerable traveling is required. Liberal benefits. Every incentive for advancement.

This is an excellent opportunity for the application of your knowledge of mining, quarrying, construction, and related industries.

Send complete resume. Photograph optional. All correspondence will be held in strict confidence, and references will not be contacted without permission of applicant.

P 9371 Eng. & Mining Journal
330 W. 42 St. New York 36, N.Y.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

RATES

UNDISPLAYED

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

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DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED

The advertising rate is $13.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns 30 inches—to a page

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. for April issue closing March 19th

WANTED
MINING PROPERTIES

Please submit complete details on acreage, location, development done, assays, engineer's report it available, and terms of purchase.

BO 9355 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

At Your Service . . .

These Classified Sections are at your service to bring business needs or "opportunities" to the attention of men in executive, management, sales and responsible technical, engineering and operating capacities with the industry served by this publication.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

BUSINESS OPPORTUNITIES

900 acres proven manganese lands in heart of Batesville-Cushman quadrangle. Will sell; might lease. Write Bee Vanemburg, Owner, Batesville, Arkansas.

Excellent opportunity for young executive with engineering background to join an established and growing Denver Engineering and Manufacturing firm specializing in industrial and engineering, material handling, mining and allied fields. Must have minimum of $15,000.00 to invest. BO-9322, Engineering & Mining Journal.

SCIENCE, NATURAL HISTORY CAMP
30 BOYS AND GIRLS, 8-12 YEARS

Geology, botany, conservation, the sky, life on earth, in air or water. Swimming, riding, crafts, shop, farm, sports. Since 1939. Eight week season, $450.

GEORGE AND CARYL DILLMAN
Hackmatack Camp, Otis, Mass.

RECOVER PRECIOUS MINERALS

With Electronic Precious Metal and Gold Segregator. Fine - Flake - Flour - Colloidal and Microscopic Gold Recovered Electronically.

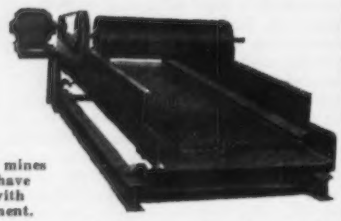
Concentrates and Samples Run and Segregated
For more information and prices write to
COMPLEX MINERALS
2424 West Adams Phoenix, Arizona

BONDED EQUIPMENT BARGAINS

IMMEDIATE SHIPMENT FROM OUR FACTORY • WRITE, WIRE OR PHONE

NEW BONDED ® HEAVY DUTY VIBRATING SCREENS

NEW BONDED ® GENERAL DUTY VIBRATING SCREENS



More than 5000 mines and quarries have modernized with Bonded equipment.

Model Number	Screening Area	No. of Decks	Sale Price
138BS	3′ x 8′	1	$1119
238BS	3′ x 8′	2	1165
338BS	3′ x 8′	3	1250
248BS	4′ x 8′	2	1695
348BS	4′ x 8′	3	1850
2410BS	4′ x 10′	2	1775
3410BS	4′ x 10′	3	2095
3412BS	4′ x 12′	3	2395

Model Number	Screening Area	No. of Decks	Sale Price
124AS	2′ x 4′	1	$355
224AS	2′ x 4′	2	375
126AS	2′ x 6′	1	375
226AS	2′ x 6′	2	395
136AS	3′ x 6′	1	495
236AS	3′ x 6′	2	585
336AS	3′ x 6′	3	815
138AS	3′ x 8′	1	575
238AS	3′ x 8′	2	695
338AS	3′ x 8′	3	845

For mineral, chemical and other industrial products. Fast, efficient and economical for cleaning, sizing, grading, dewatering. Made in all metals including stainless steel. Enclosed models for hot materials or dust control. Bonded screens are built for any screening operation, wet or dry. HEAVY DUTY MODELS: Type BS, 4-bearing, positive throw, eccentric shaft; 3′x8′ to 5′x14′, 1 to 5 decks. GENERAL DUTY MODELS. Type AS, eccentric weight mechanism, spring mounted, 1 to 3 decks, 2′x4′ to 3′x8′. Write for new 8-page Bulletin 1086 and 1087.

BONDED CARRIES LARGE STOCKS OF SCREEN CLOTH FOR IMMEDIATE SHIPMENT

NEW BONDED ® TROUGHING IDLER CONVEYOR BARGAINS

Complete Ready-Fab sections quickly and easily joined together on the job. We take our loss on our stock of short length belting. You can save as much as 50% on the BONDED CONVEYOR SPECIALS listed, with conveyor belting in two pieces. Conveyors are equipped with 5″ roll diam. idlers and return rolls, 20″ diam. head pulley and 16″ diam. tail pulley mounted on 2¼″ or 2-7/16″ diam. shaft. Belt is new 4-ply, 28-oz. duck, ¼″ top rubber cover x 1/32″ bottom cover and is fresh stock made by leading manufacturers.

Remember, You Save Up To 50%

CONVEYOR PRICES INCLUDE BELTING

Belt Width	Length of Conveyor	List Price	Sale Price
14″	25′	$1166	$ 672
14″	50′	2016	1064
14″	85′	3206	1612
16″	20′	1083	592
16″	45′	1928	1012
16″	60′	2494	1264
18″	25′	1327	739
18″	45′	1986	1085
18″	85′	3466	1798
18″	100′	4001	2065
20″	25′	1366	770
20″	60′	2762	1426
20″	90′	3959	1995
24″	25′	1428	835
24″	45′	2227	1237
24″	70′	3226	1744
24″	100′	4425	2339
30″	50′	2669	1504
30″	70′	3576	1971
30″	90′	4485	2432
36″	25′	1632	1040
36″	45′	2492	1561
36″	60′	3327	1950
36″	100′	5102	2990

For conveyors longer or shorter than those listed above, add or deduct the following per foot prices according to belt width. Prices include belting.

For 14″ belt	$15.66 per foot
For 16″ belt	16.78 per foot
For 18″ belt	17.90 per foot
For 20″ belt	18.95 per foot
For 24″ belt	20.26 per foot
For 30″ belt	23.02 per foot
For 36″ belt	26.00 per foot

NEW CONVEYOR BELTING

SAVE UP TO 25%

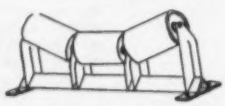
Heavy duty 4-ply, 28-oz. duck, ¼″ top rubber cover x 1/32″ bottom cover rubber belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stock.

Width	List Price	Sale Price
14″	$3.43 foot	$2.75 foot
16″	3.86 foot	2.88 foot
18″	4.27 foot	3.19 foot
20″	4.69 foot	3.69 foot
24″	5.55 foot	4.14 foot
30″	6.77 foot	5.06 foot
36″	8.01 foot	6.00 foot

Additional widths and plies available at low prices. Write for free sample.

NEW IDLERS & RETURN ROLLS

25% BELOW LIST PRICE



3-roll, 5″ diameter Troughing Idlers for

14″ belt	$17.25	24″ belt	$19.75
16″ belt	18.00	30″ belt	20.50
18″ belt	19.00	36″ belt	21.25
20″ belt	19.25	48″ belt	23.75

1-roll, 5″ diameter Return Idlers for

14″ belt	$ 6.75	24″ belt	$ 8.00
16″ belt	7.00	30″ belt	8.75
18″ belt	7.50	36″ belt	9.25
20″ belt	7.75	48″ belt	10.75

All steel. Interchangeable with other well-known makes. Furnished with easily replaceable pre-lubricated Sealed ball bearings. Also can be furnished with greasable type Alemite Fitted bearings. Maintenance is negligible.

Write for Free Catalog and Prices

BONDED SCALE & MACHINE CO.

Mfrs. of Scales, Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers and Feeders

97 KINGSTON, COLUMBUS 7, OHIO • PHONES: Hickory 4-2186; AXminster 1-2213 EVES.

FLOTATION EQUIPMENT complete including pulp sampler and distributor, mineral jigs, 6 cell flotation machines, super charger, agitator, 4″ concentrate pumps, reagent distributors, etc. Used only 300 hours.

BALL MILLS: One 9′6″ x 11 ft., NEW. Two Allis Chalmers 5 ft. x 22 ft. Tube Mills with steel heads.

ROD MILLS: 2—Marcy Open End size 5′ x 14′.

PAN CONVEYOR: 48″ x 110 ft., 100 H.P. motor, 440 volt, with speed reducer and drive.

PAN FEEDERS: Heavy duty manganese 60″ x 14 ft., 20 H.P. motor, 220/440 volt, with speed reducer and drive, NEW condition. Link Belt 36″ x 10 ft. with motor and reducer.

JAW CRUSHERS: 9 x 12, 10 x 20, 15 x 36, 18 x 30, 24 x 36, 30 x 42, 42 x 40, 48 x 60, with or without motors.

REDUCTION CRUSHER: Symons 2 ft., standard bowl.

DRYERS: 2—Ruggles Coles XA18, 104″ x 70 ft., double shell, with 60 H.P. motor, speed reducer, exhauster, etc., suitable for use as kilns. Available 90 days. One 6′ x 60 ft. and one 5′ x 30 ft. complete with all auxiliary equipment.

SCREENS: Tyrock 5′ x 12′ single deck, type F600. Allis Chalmers 4′ x 12′, single deck, low head.

LOCOMOTIVE CRANE: 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota. For sale or rent.

SLUSHER HOIST: Ingersoll Rand 50-MHM4C, 3 drum, 50 H.P., 220/440 volt. Also, one 15 H.P., 2 drum.

MINE HOIST SPECIAL: Vulcan 650 H.P., double drums, 8′ dia., 7′6″ face, one drum clutched, 1⅝″ rope, 1400 FPM, thoroughly modern, with control and safety devices.

MINE HOISTS: Single and double drum 100 to 2500 H.P., with all electrical equipment. Complete specifications, drawings, photos available.

MOIST MOTORS:
300 H.P., 435 RPM. 600 H.P., 710 RPM.
400 H.P., 588 RPM. 1200 H.P., 444 RPM.
2200 volt, A.C., with controls.

MOTOR: G.E. 50 H.P., 2200 volt, 3 phase, 60 cycle, 450 RPM, with control equipment.

WE BUY AND SELL EQUIPMENT THROUGHOUT NORTH AND CENTRAL AMERICA

A. J. O'NEILL

Lansdowne, Pa.

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COMPRESSOR DIRECTORY

World's Best Rebuilts

All Makes
Many Sizes

Electric
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Air for Sale or Rent
Since 1902

1 CFM to 5700 CFM
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FOR SALE

Hardinge Conical Steel Ball Mill, 6′ dia. x 22″ long.
Allis Chalmers Ball Mill, 6′ D x 16′ L
Rotary Dryers and Kilns: 3′ D x 24′; 4′6″ D x 40′; 5′ D x 30′
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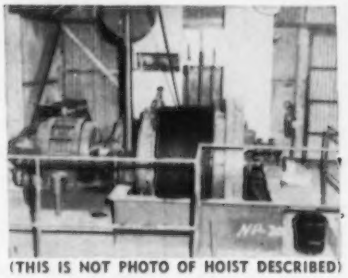
SPECIFICATIONS

300 HP TWO-DRUM MINE SHAFT HOIST

MANUFACTURER: WELLMAN-SEAVER-MORGAN—
Wellman Engineering Company
7000 Central Avenue
Cleveland 4, Ohio

SERIAL NUMBER AND DATE: Unit Serial No. 740 — Built in 1928-29

PREVIOUS USER: Riverside Cement Company, Riverside, California



(THIS IS NOT PHOTO OF HOIST DESCRIBED)

COMPLETE AS FOLLOWS:

DRUM DIMENSIONS: 2 parallel drums, cylindrical, 7' diameter, 5' face, 7" flange depth, 7'0" center to center of drums, 8'2" diameter drum flanges.

CONSTRUCTION OF DRUMS: ROLLED PLATE STEEL SHELL—1½" thickness, grooved for 1¼" diameter Rope.

DRUM CAPACITY: 931 ft. 1¼" rope each wrap; number of wraps varies according to state laws.

DRUM SHAFT: 12⅛" diameter through drums, three bearings.

BRAKES: Hydraulically operated, post type. Brake ring each drum is 10'0" diameter, 13" face. Brake blocks 3" thickness, with rubbing area each brake beam 1130 sq. inches.

CLUTCHES: Each drum separately clutched, hydraulically operated. Axial friction type clutches on ends of drums, clutch ring diameter 6'7", total area friction blocks 3166 sq. inches.

HYDRAULIC SYSTEM: 2 Northern Pump Company accumulator oil pumps and piping. Brake and clutch cylinders 5" bore, 14" stroke.

GEARING: Single reduction drive. Enclosed herringbone gear—214 teeth, 1½ D.P., 14" face, cast steel; pinion—16 teeth, 1½ D.P., 14" face, nickel steel.

PINION SHAFT AND COUPLING: Pinion shaft is 6½" diameter with 2 bearings 16" long. Flexible coupling No. 19-C, Falk.

MOTOR: Westinghouse 300 HP wound rotor motor, 2200 volt, 3 phase, 60 cycle, 450 rpm, frame 1118-A, type CW, continuous duty 40° rise.
(This hoist was originally constructed to handle up to 450 HP motor, 600 rpm, so long as the rope pull on each drum does not exceed 22,100 lbs. This motor would increase rope speed to 950 fpm.)

ROPE SPEED AND PULL: 700 fpm rope speed with 12,000 lbs. unbalanced load pull—22,100 lbs. balanced operation.

LOCATION: Can be inspected in operation at Riverside Cement Company, Riverside, California, by appointment. (We own this hoist outright.)

PRINTS AND PHOTOS: We have a complete set of general prints, drum details, foundation drawing, actual photographs. Write for these if required.

We also have the following available.

1—BRAND NEW 450 HP Ottumwa double-drum, 16,000# balanced load lift at 800 fpm.
1—400 HP Vulcan-Denver double-drum, 20,500# pull at 1,000 fpm. New in 1952.
1—300 HP Denver Engineering Works double-drum, 16,000# pull at 500 fpm.
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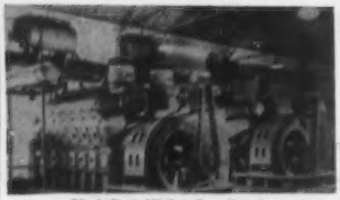

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ALPHABETICAL INDEX TO ADVERTISERS

(This index is published as a convenience to the reader. Every care is taken to make it accurate, but E&MJ assumes no responsibility for errors or omissions.)

Acker Drill Co., Inc. 182
Ainsworth & Sons, Inc., Wm. 205
Allen-Sherman-Hoff Pump Co. Second Cover
Allis-Chalmers Mfg. Co. (General Machinery) 41, 62, 122, 181
Allis-Chalmers Tractor Div. 8, 9, 56
Alpha Molykote Corp. 207
American Brattice Cloth Corp. 188
American Chain & Cable Co. (Hazard Wire Rope Div.) 57
American Cyanamid Co. Insert between pp. 18-19
American Forge Co. 144
American Manganese Steel Div. American Brake Shoe Co. 48
American Pulley Co. 217
Armour Chemical Div. Armour & Co. 29
Armstrong-Bray & Co. 202
Atlas Car & Mfg. Co. 180

Babcock & Wilcox 172
Baker & Adamson General Chemical Div. Allied Chem. & Dye Corp. 134
Barber-Greene Co. 149
Bemis Bro. Bag Co. 162
Bethlehem Steel Co. 20, 52, 157
Birdsboro Steel Fdry. & Mach. Co. 196
Booth Co., Inc. 205
Brunner & Lay, Inc. 140
Bucyrus-Erie Co. 58
Buell Engineering Co. 170

C & D Batteries Inc., 192
Carrier Conveyor Corp. 184
Carpco Mfg., Inc. 208
Caterpillar Tractor Co. 42, 113, 145, 218
Clark Equipment Co. 152, 153
Cleveland Vibrator Co. 186
Colorado Fuel & Iron Corp. 10, 11, 135
Colorado Iron Wks. Co. 44
Conrader Co., R. 206
Continental Gin Co. 190
Coppus Engrg. Corp. 115
Crane Co. 12
Crucible Steel Co. of America 34

Deister Machine Co. 180
Denver Equipment Co. 111
Detroit Diesel Engine Div. General Motors Corp. 53
Dings Magnetic Separator Co. 155
Dorr-Oliver, Inc. 119, 125
Dow Chemical Co. 46, 177
du Pont de Nemours & Co., Inc. (Explosives Dept.) 147

Eimco Corp. 61, 65, 150
Engineering & Mining Journal 136, 137
Ensign-Bickford Co. 43
Euclid Div. General Motors 38
Equipment Engineers, Inc. 201
Exide Industrial Div. Electric Storage Battery Co. 167

Fagertun Fabrikker A/S 207
Firestone Tire & Rubber Co. 193
Falk Corp. 50A
Flexible Steel Lacing Co. 198

Galigher Co. 22, 154
Gardner-Denver Co. 45
Garlock Packing Co. 191
General American Transportation Corp. (Turbo-Mixer Div.) 129
General Electric Co. (Loco. Div.) 28
General Electric Co. 64
General Refractories Co. 151
General Tire & Rubber Co. 133
Goodrich Co., B. F. 5
Goodyear Tire & Rubber Co. 13
Greensburg Machine Co. 140

Hammond Co., J. V. 202
Hardinge Co., Inc. 132
Hawthorne, Inc., Herb J. 194
Hazard Insulated Wire Wks. 143
Hendrick Mfg. Co. 206
Houston Tool Co. 148

Industrial Brownhoist Co. 141
Ingersoll-Rand 3
International Harvester Co (Drott Mfg. Corp.) 49
International Nickel Co. 59

Jeffrey Mfg. Co. 195
Johnson Co., C. A. 32, 33
Jones & Laughlin Steel Corp. 47
Joy Mfg. Co. 24, 54, 139

Kennedy-Van Saun Mfg. & Engrg. Co. 117
Koehring Co. 32, 33
Koppers Co., Inc. 197

Lake Shore, Inc. 173
Le Roi Div. Westinghouse Air Brake Co. 171
Leschen Wire Rope Div. H. K. Porter Co., Inc. 121
LeTourneau-Westinghouse Co. 19, 21, 23, 25
Linatex Corp. of America 206
Link Belt Co. 169
Longyear Co., E. J. 51

Mack Trucks 127
Manhattan Rubber Div. 60
Manitowoc Engrg. Corp. 166
Marion Power Shovel Co. 200
Mayo Tunnel & Mine Equip. Co. 176
McNally Pittsburg Corp. 207
Merrick Scale Mfg. Co. 148
Mine Safety Appliances Co. 63
Mine & Smelter Supply Co. 50, 176
Minneapolis-Honeywell Regulator Co. (Indus. Div.) 30
Mount Sopris Instrument Corp. 204

National Filter Media Corp. 168
Naylor Pipe Co. 156
New York Engrg. Co. 208
Nordberg Mfg. Co. 37, 183
Northwest Engrg. Co. 15

Ohio Brass Co. 130, 131

Parsons Co. 32, 33
Pennsylvania Drilling Co. 208

Raybestos-Manhattan, Inc. 60
Remington Arms Co., Inc. 187
Revere Corp. of America 138
Riblet Tramway Co. 182
Ridge Tool Co. 217
Roebling Sons Corp., J. A. 31
Ryerson & Son, Inc., J. T. 109

Sanford Day Iron Wks. 16, 17
Sauerman Bros., Inc. 158
Searchlight Section 209-215
Sheffield Steel Corp. 163
Simplex Wire & Cable Corp. 14
Skookum Co., Inc. 205
Smidth & Co., F. L. 199
Smit & Sons, Inc., J. K. 164
Smith Engineering Wks. 55
Spang & Co. 128
Sprague & Henwood, Inc. 204

Stearns Magnetic, Inc. 160
Straub Mfg. Co., Inc. 178
Sturtevant Mill Co. 165
Superior-Lidgerwood-Mundy Corp. 174

Texas Co. 6, 7
Texas Gulf Sulphur Co. 175
Thermoid Co. 27
Timken Roller Bearing Co. Fourth Cover
Traylor Engrg. & Mfg. Co. 18A, 159
Turbo-Mixer Div. General American Transportation Corp. 129

United States Rubber Co. 107
United States Rubber Co. (Tire Div.) 179

Victaulic Co. of America 146

Walworth Co. 26
Wedge Wire Corp. 39
Western Machinery Co. 18
Western Precipitation Corp. 185
Western Rock Bit Mfg. Co. 161
Wheel Trueing Tool Co. Third Cover
Wheelabrator Corp. 189
Wickwire Spencer Steel Div. Insert between pp. 50-51
Wilfley & Sons Co., A. R. 66
Willys Motors, Inc. 203

Yuba Mfg. Co. 142

PROFESSIONAL SERVICES 209

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 210, 211

BUSINESS OPPORTUNITIES 211

EQUIPMENT (Used or Surplus New) For Sale 211-215

ADVERTISERS INDEX

Acme Personnel Service 210
American Air Compressor Corp. 212
Bonded Scale & Machine Co. 212
Carlyle Rubber Co. 215
Complex Minerals 211
Dillman, George F. 211
Eljay, Inc. 213
Gouverneur Talc Co., Inc. 215
Groban Supply Co. 215
Heineken, Inc., W. P. 215
Laclede-Christy Co. 213
Lefton Industrial Co. 214
Machinery Center, Inc. 213
Miller Machinery Co. 214
Morse Bros. Machinery Co. 215
O'Neill, A. J. 212
Perry Equipment Corp. 212
Rhoanglo Mines Service, Ltd. 210, 211
Roberts Electric Co. 214
Schoonmaker Co., A. G. 214
Universal Wire & Cable Co. 213

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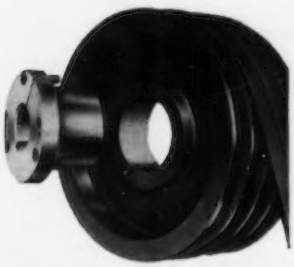
. . . of American Adjustable-Diameter Sheaves, allowing stepless speed variation by internal change of pitch diameter. Exclusive *double-taper* hub locks flanges in position, locks sheave to shaft. Positive speed control is assured for crushing, vibrating, grinding and other processing operations.

. . . of American Wedg-Tite Bushings with exclusive *steeper taper* for fast installation and easy removal, uniform compression, positive alignment, and maximum clamping action on the shaft.

. . . of American Wedgbelts, mold-cured to vary less than ¼ of 1% in length, with strict uniformity in taper, thickness and width. Dacron* cords in Super-Service Wedgbelts are 2½ times stronger than rayon, withstand shock loads and high starting torques.



. . . of AmericanWedg-Tite Companion Sheaves, precision-matched to the same taper of the bushing, the exact sidewall angle of the belt. Machined to a satin finish, with accurate balance and concentricity, they lower frictional power-loss, increase efficiency.

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Seminole Rock Products of Miami, Fla., bought five CAT* DW15s with W15 Wagons on the basis of its previous experience with Caterpillar products. Dragline loaded with lime and coral rock, these units make a 1650-ft. haul (with short 10% adverse grade) over excellently maintained roads to the processing plant, and 2000-ft. return. After the Caterpillar DW15s had been on the job long enough to show what they could do, here is what General Manager L. G. Bunnell had to say:

"These DW15s have power to spare. With an average load of 15.2 yd. (45,600 lb. actual weight), haul and return time is only 4.09 minutes. The five units haul 358 cu. yd. per hour—estimated hauling cost is only 9.2¢ per yard. Thanks to their powerful Cat Engines, the DW15s started up from the dragline in second gear, high range.

"We are particularly satisfied with their extreme economy. In more than 1600 hours of combined operation, these five new Caterpillar DW15s have had no down time. Their rugged construction and trouble-free operation are important factors in cutting costs. Important, too, are their ease of maintenance and their ability to deliver full, foul-free power on No. 2 furnace oil.

"We like the high maneuverability of the Cat DW15 and W15 Wagon," Mr. Bunnell concludes. "This, with their dependability and power, speeds up our operation considerably."

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1910 *Our 46th Anniversary* **1956**

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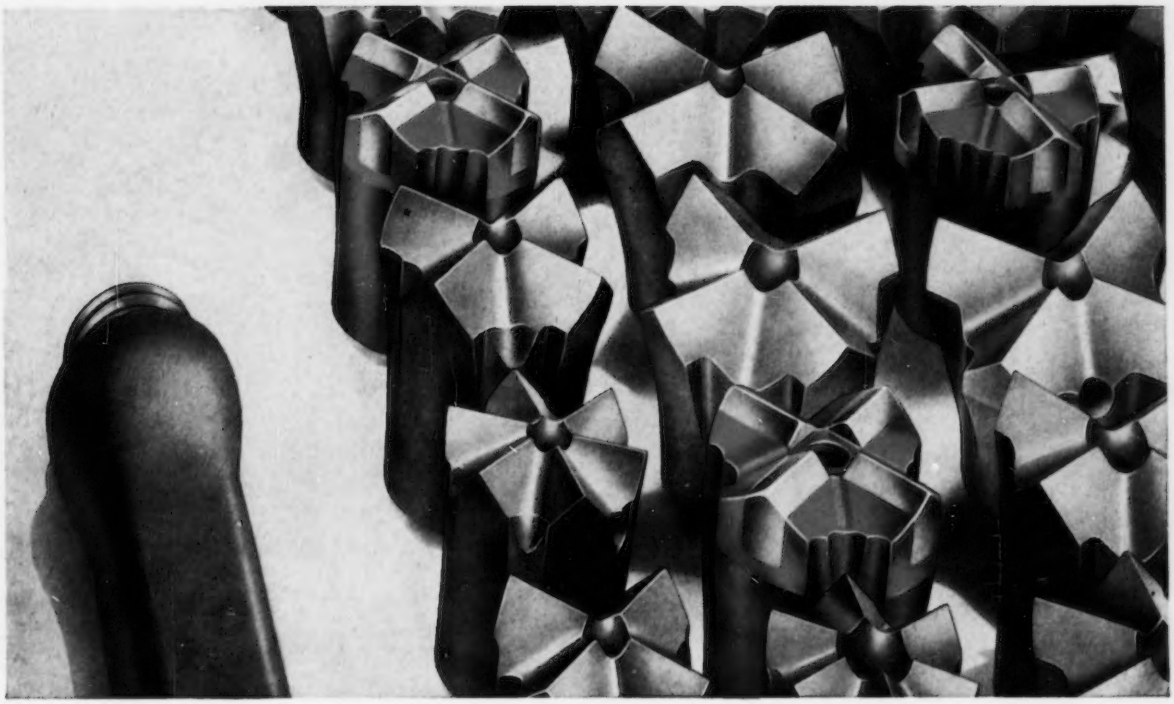
SAVE DRILLING TIME— CUT STEEL INVENTORY



TIMKEN® interchangeable rock bits let you switch bit types without switching drill steels

YOU can save valuable drilling time when changing ground calls for a change in bit type. Dozens of different Timken® rock bits—multi-use and carbide insert—fit the same drill steel . . . can be changed quickly and easily, right on the job . . . with no need to change drill steel. Simply screw one type off, screw the other right on the same drill steel. It takes but a minute.

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